THE RUBBER AGE

ESTABLISHED 1917

COVERS ALL PHASES OF THE PRODUCTION AND MARKETING OF CRUDE RUBBER AND THE MANUFACTURE AND DISTRIBUTION OF RUBBER GOODS

Vol. 42 MARCH, 1938 No. 6

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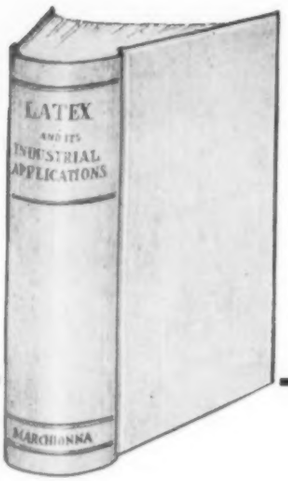
BOOKS on RUBBER



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BIBLIOGRAPHY OF RUBBER LITERATURE FOR 1935, compiled by D. E. Cable. 132 pp.—6 x 9 in. Cloth Bound, $2.00, Paper Bound, $1.00

The first annual bibliography of rubber literature, this book has already proven an invaluable aid to the technologist and librarian whose work requires constant reference to technical articles and publications on subjects peculiar to the rubber industry.

1937 RUBBER RED BOOK—Directory of the Rubber Industry with Annual Bibliography of Rubber Literature for 1936 compiled by D. E. Cable. 370 pp.—6 x 9 in. . . Cloth Bound, $3.00, Paper Bound, $2.00

The first directory of its kind to be published in over ten years, this book contains complete listings of rubber manufacturers in the United States and Canada by product and location, machinery and chemical concerns, fabric, reclaiming, and latex equipment houses, crude rubber dealers, agents and brokers, scrap rubber dealers, and manufacturers of special products used in the rubber industry. There is also a complete latex section, including an article on latex compounding by Royce J. Noble, and the Annual Bibliography of Rubber Literature for 1936. A comprehensive presentation of information necessary to all who are connected with the rubber industry.

COMPOUNDING INGREDIENTS FOR RUBBER. 226 pp.—5 x 7 in. In United States, $2.50, Foreign $2.75

A compilation into book form of information previously published in the INDIA RUBBER WORLD. A complete list of the composition, application, physical properties, use, patent and source of a large number of rubber chemicals and compounding ingredients. Presents a composite view of the ingredients available for rubber work.

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Rubber Technology Conference

Program Formulated for International Meeting to Be Held in the Hotel Victoria, London, on May 23 to 25

PLANS for the long announced Rubber Technology Conference to be held in London under the auspices of the Institution of the Rubber Industry on May 23-25 are proceeding rapidly, with the scope of the program already outlined and invitations extended to rubber technologists in all countries. The purpose of the Conference is to bring together a representative gathering of rubber chemists, physicists, engineers, etc., from all corners of the world for a mutual discussion of inter-related problems. The Rubber Division of the American Chemical Society has sanctioned support of the international meeting. Dr. A. R. Kemp, of the Bell Telephone Laboratories, New York City, is the official American delegate.

General Information on the Meeting

It is intended that matter submitted to the Conference shall be original in nature and practical in character. In addition to the technical sessions, visits to leading British rubber factories, as well as to scientific and educational institutions, are being arranged. A "general reporter", appointed by the Conference Organization Committee, will direct the attention of each sectional meeting to points which might most usefully be discussed. Reviews of the papers will be available at the meeting. It is the intention of the sponsors to also make available copies of papers and general reports as long in advance of the meeting as possible and so conserve the major portion of Conference time for profitable discussion.

In order that the Rubber Technology Conference may meet with a definite object in view, it has been decided that the principal part shall be a Symposium on Methods of Improving and Evaluating the Durability of Rubber. Contributions dealing with aspects of this field are being particularly solicited by the Council of the Institution of the Rubber Industry. To avoid confining the Conference within too narrow limits, however, and to provide for the interests of those whose work is not directly concerned with the subject of the symposium, the latter half of the program will be devoted to general subjects. The scope of the Conference will be seen from the following tentative program.

Part I—Methods of Improving and Evaluating the Durability of Rubber

1. Manufacturing conditions, including compounding.
2. Uses of "synthetic rubbers" and allied plastics.
3. Testing methods, including chemical, physical, performance, and accelerated aging tests.

PART II—GENERAL SUBJECTS

1. Chemistry and physics of latex and rubber.
2. Technology of latex and rubber.
3. Rubber derivatives and their uses.
4. Raw materials of the rubber industry. (Compounding ingredients, solvents, varnishes and finishes, fibers and textiles.)
5. Manufacture of particular goods. (Tires, belting, electric cables and insulation, footwear, sports goods, toys, hose, general mechanicals, roads and flooring, surgicals, textile-rubber goods, sponge and cellular rubber, hard rubber.)
6. Machinery and appliances, steam and heat. (Water, automatic control, layout, transport, packing, storage, maintenance.)
7. Organization and administration. (Technical education, production planning and efficiency, safety and welfare, costing, marketing, economic problems.)

In outlining its instructions for papers the Conference Organization Committee stresses the point that papers must be completely original, of approximate 5,000-word length, include a summary and conclusion, and should avoid too great detail. A general review of the development and problems of the subject under discussion should be part of the paper, which should be accompanied by a bibliography if possible. Complete instructions for authors of papers will be found in the January, 1938, issue of *Rubber Chemistry & Technology*. Communications concerning papers should be addressed to: The Secretary, Institution of the Rubber Industry, 12 Whitehall, London, S.W. 1, England.

The technical sessions of the Conferences will be held in the Edward VII Suite of the Hotel Victoria, Northumberland Avenue, London, W.C. 2. This hotel is near Trafalgar Square and is conveniently situated from all aspects. The lecture hall will seat 300 easily and microphones will be installed to insure perfect reception of all papers and discussions.

Data secured by the American Committee on sailing dates reveals that the *S. S. Britannic*, which sails at 12:00 Noon on Saturday, May 14, is the best steamer for those desiring to attend the Conference. This steamer also stops at Boston and is due at Southampton on Sunday, May 22. For those able to leave a little earlier and spend some time in England before the Conference opens, the *S. S. Champlain*, which sails on May 12 and arrives in Plymouth on May 19, is recommended. One-way tourist fare on the *Britannic* is $124 and it is $127 on the *Champlain*. For delegates who prefer to sail on express liners, there is the *Bremen* and the *Queen Mary*, sailing on May 10 and 11, respectively.

All further information on the Rubber Technology Conference, including last minute arrangements, may be secured from any member of the American Committee on Arrangements. This committee includes the following: Dr. A. A. Somerville, R. T. Vanderbilt Co., 230 Park Avenue, New York City; Wm. B. Wiegand, Columbian Carbon Co., 41 East 42 Street, New York City; and John M. Bierer, Boston Woven Hose and Rubber Co., Cambridge, Mass. Lt.-Col. B. J. Eaton, of the Institution of the Rubber Industry, is Honorary Conference Secretary.

Development of Rubber Mudguards

THE subject of rubber mudguards for both passenger and commercial vehicles has occupied the attention of engineers both in this country and abroad for many years. Despite the fact that mudguards made of rubber would cost considerably more than those of metal, due to the high cost of the molds required and slower output due to the need for vulcanizing the rubber, the subject has continued to be of interest because of several obvious advantages offered by rubber mudguards over present types. In England, the Dunlop Rubber Company, Ltd., has pioneered in the development of rubber mudguards and has already produced a range of molded mudguards suitable for a variety of commercial vehicles.

The Dunlop rubber mudguards are molded to shape and careful attention to compounding as well as design is said to have resulted in sufficient rigidity being obtained without the necessary flexibility of the mudguards being impaired. One factor which is holding back the wider adoption of these rubber mudguards is the lack of standardization of size and shape in the mudguards required by the makers of coach or bus bodies. There is a move toward standardization now being undertaken and it is possible that it may bring the desired result.

The development of rubber mudguards has necessarily followed orthodox metal mudguard practice, so much so, in fact, that it is said to be difficult to distinguish between the two types at first glance. The Dunlop type of mudguard is comparable with mudguards of 18-gauge steel from the standpoint of weight. The standard color of these rubber mudguards, according to a pamphlet recently issued by Dunlop, is black with a high natural finish, although the mudguard may be painted in any color.

"Adjustyo-Step" Foot Support

A SIMPLE, practical adjustable support for use with rubber canvas and leather footwear has been created by H. L. Whitman. The Cambridge Rubber Company, Cambridge, Mass., are licensees for the new support—called "Adjustyo-Step"—in rubber canvas footwear and also the package trade. The new support consists of a number of layers of a special light-weight material, each layer being bonded to the adjoining layer by a new type of cement for which permanent tackiness is claimed. The layers are approximately 1/64th of an inch thick and can be separated from one another by peeling them off one at a time. By this construction, proper adjustment can be made so that the utmost comfort can be secured by the wearer.

Inserted in the shoe, "Adjustyo-Step" gives support not under the surface of the arch, but directly below the inner ankle bone which, according to the inventor, is the proper point for such support if pronation is to be prevented and foot comfort achieved. When inserted in rubber canvas or leather footwear, the support permanently adheres to the innersole so that only the top adjustable layers are removable. For the package trade, a special cement is furnished whereby the support can be placed in any shoe and the cement used to immediately create a bond between the unit and any type of insole.

According to Cambridge, the layers composing "Adjustyo-Step" are so light that they float, will not rust or crack, do not cause perspiration, and can be removed or replaced at will. Only five sizes of the new support are needed to fit any type of shoe, whether men, women, boys, youths, misses or children. For the package trade, the device is put up in a counter container packed with one dozen assorted sizes.

Fluid Power Application in the Rubber Industry

A Description of the Various Commercial Units Available and Their Adaptability to Rubber Manufacturing Processes

By M. E. Engebretson
The Oilgear Company, Milwaukee, Wisconsin

FLUID power pumps, motors, and transmissions have for many years performed important functions in many of the manufacturing processes used in domestic and foreign rubber factories. Because of their controllability, flexibility, durability and efficiency they have met the demands for variable speed drives to regulate accurately the speed of individual or successive conveyors and machine sections. High speed continuous production of quality products has been made possible because of the desirable characteristics inherent in fluid power devices.

Most fluid power transmission systems for conveyor drives consist of a constant speed volumetric variable displacement pump which drives either one or a series of constant or variable displacement motors. Usually, these units are so arranged in series that a constant stroke motor drives the master conveyor section and its speed is controlled by the setting of the pump hand-wheel. Other sections of the conveyor system are usually driven by individual variable stroke motors so that their speeds can be adjusted independently to compensate for any shrinkage or stretch in the product.

High grade lubricating oil, used as the fluid power, flows from unit to unit through connecting pipe lines. This permits the installation of pump and prime mover at a convenient point quite a distance from the fluid power motors which it drives. Each fluid power motor can be mounted integral with the conveyor section it drives. Thus, the flexibility of fluid power equipment greatly simplifies the installation by eliminating line shafts, stub shafts, bearings, gears, pulleys, belts and individual reducers required for most mechanical power transmissions. The advantages of fluid power are especially evident on the many systems which extend over two or more floors.

FIG. 1—Variable displacement pump.

FIG. 2—Variable displacement motor.

The variable displacement pump unit, Figure 1, is of the radial multiple piston type connected directly to an electric motor and equipped with a large, convenient hand-wheel control. The pump unit proper consists of a pintle, a cylinder barrel with seven or more closely fitted pistons, one or more reaction rings, a rotor and slide block. The cylinder barrel rotates on a fixed pintle and is driven by the input shaft through a floating coupling flange. Centrifugal force keeps the pistons against the reaction rings at all times. The rotor which contains the reaction rings is mounted on large anti-friction bearings and rotates with the cylinder barrel through contact of the pistons against the reaction rings. A slide block which carries the rotor unit is used to vary the stroke of the pistons.

In operation, the pump shaft is driven from any constant speed source of power. When the hand-wheel control is adjusted so the centerline of cylinder and rotor coincide no reciprocating motion is imparted to the pistons as the unit rotates, so no oil is delivered. If the control is adjusted to move slide block and rotor slightly off center only a small quantity of oil is discharged. By increasing the eccentricity of the rotor unit, the stroke of the pistons, and hence the volume of oil discharged, is proportionately increased. Oil is carried to and from the pistons through flanged pipe connections, cored passages and drilled passages in the case, pintle and cylinder. The direction of oil flow is reversed by moving the rotor to the opposite side of the cylinder centerline.

Simple, direct hand-wheel control permits operator to select accurately the position and movement of the slide block, thus permitting the oil discharged to be varied smoothly over a stepless range in either direction from zero to maximum. Full protection against overload of input mechanism, pump unit, and driven machine is provided by a built-in relief valve adjusted to operate at any pressure within the working capacity of the unit. The main fluid power system is partially supercharged with hydraulic controls actuated by an internal gear pump.

Figure 2 illustrates a variable displacement motor of the radial multiple piston type. The working parts on this unit are practically identical with those used in the variable displacement pump. Oil discharged from the pump flows to the fluid power motor and forces the pistons over one port outward, thus inducing the motor cylinder, rotor and output shaft to rotate.

Selection of constant torque or constant power over a wide range in either direction is conveniently obtained when using units shown in Figures 1 and 2. By varying the pump stroke the speed of the motor shaft will be changed but the maximum torque available remains constant. Reversing the pump discharge changes the output shaft rotation of the motor. By varying the motor stroke the speed and torque change but the power output remains constant.

Figure 3 shows a radial multiple piston constant displacement motor. The working parts of this unit are practically identical with those used in the variable displacement pump except that the slide block is omitted and the rotor rotates on a fixed centerline providing maximum piston stroke. Variable speed constant torque is obtained when using units shown in Figures 1 and 3. The maximum horsepower which can be transmitted is directly proportional to the speed at which the motor is operated.

Almost any variable speed transmission need in rubber factories can be met with commercial units. Standard pumps and motors are available in conventional sizes from 2 to 100 H. P. Control of the variable displacement units can be direct through a large hand-wheel and screw or a hand-wheel on worm shaft and worm wheel on screw shaft. Convenient remote control can be made available through push buttons and integral electric motor control, sensitive hydraulic servo-motor control, hydraulic two-speed control, or pendulum and disc type precision speed controls.

Variable speed transmissions (as shown in Figure 4) offer additional compactness by incorporating the variable displacement pump and constant displacement motor in one case. These are available in conventional sizes from 2 to 20 H. P. The high-grade lubricating oil used as the power fluid flows from the input unit to the output unit through drilled and cored passages, thus even eliminating the necessity for piping. Electric motors can be direct-connected to input shaft through a flexible coupling or flanged to transmission case. For maximum power at reduced speed, straight or angle type speed reducers of approximately 3:1 ratio can be flanged direct to the transmission case. For greater reductions, commercial reducers can be coupled to the transmission.

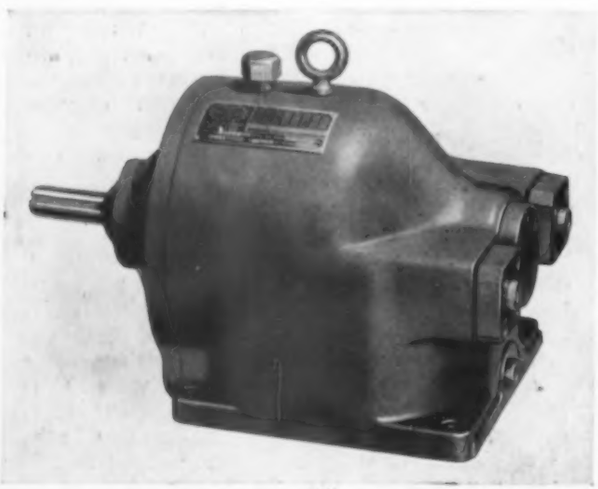

FIG. 3—Constant displacement motor.

FIG. 4—Variable speed transmission.

Applications

Conveyors for tread tubing, tube tubing, bead wire, calender, spreader, wire insulating, clincher bead tubing, flap tubing, camel back, and wringer roll drives are fluid power equipped. On these drives fluid power equipment provides: (1) unit operation of sectional conveyors from one constant speed source of power; (2) stepless acceleration and deceleration of sectional conveyors simultaneously; (3) independent manual or automatic stepless variation of individual sections without affecting the speeds of other sections. Gauges between the various units provide continuous indication of load on each section during normal operation, as well as any overload.

Figure 5 shows in diagrammatic form a variable speed fluid power drive for a tread tubing sectional conveyor extending over several floors. Four separate conveyors carry a continuous extruded flat rubber strip from the tubing machine at the left to the cutting-off machine at the right. The rubber strip is handled successively by each conveyor. Accurate, stepless speed variation of the conveyor system is essential to suit the rate of production, to control the weight of the product, to compensate for the shrinkage of the product as its temperature decreases and to cut the product into definite lengths while operating at high speed production.

One constant speed electric motor operating the variable displacement pump unit "A," at a convenient remote point, drives the variable displacement motor unit "B." Motor "B" discharges its fluid as a pump to drive the constant displacement motor unit "C." Motor "C" discharges its fluid as a pump to drive the constant displacement motor unit "D." Motor "D" discharges its fluid as a pump to drive the variable displacement motor unit "E." Motor "E" discharges its fluid back to pump "A." Thus, the variable displacement pump "A" drives the group of motors and their respective conveyors as a unit.

After starting the electric motor, the entire conveyor system is accelerated slowly to the desired speed by increasing the displacement of the constant speed pump "A" with the hand-wheel. The first section of the conveyor is mounted on a scale which weighs the tread as it comes from the tubing machine. If the tread is too heavy a signal light flashes and the operator increases the speed of the entire system by adjusting the displacement of pump "A." If the tread is too light another signal light flashes and the operator reduces the speed of the entire system by adjusting the displacement of pump "A." The constant stroke motor unit "C" drives the master conveyor section, and the speed at which it runs is the average mean speed of the entire conveyor.

All sections of the conveyor move at approximately the same speed, but as the first conveyor is mounted on a scale to control the weight of the rubber strip, the length of the rubber changes while on the conveyor and the speeds of the first and last conveyors must be varied in relation to those of the other two. By adjusting the stroke of motors "B" and "E" the speeds of the first and last conveyors in the train can be varied to suit the changes in rubber length, which is not a fixed amount. Since the volume delivered by pump "A" is unaffected when adjusting the strokes and speeds of motors "B" and "E," the speeds of motors "C" and "D" will remain constant.

The last section of the conveyor is the automatic cutting-off machine which cuts the tread to the proper length. To perform this operation it is necessary to stop the last conveyor section momentarily. This is accomplished by using the variable displacement motor unit "E" with automatic sensitive control to drive the last conveyor section through a clutch which is electrically operated. When the tread reaches a definite point on the conveyor an electric switch disengages the clutch and the conveyor stops. At the same time the knife starts across the conveyor and cuts the tread to the proper length. When the knife has completed its cut it contacts an electric switch which engages the clutch and starts the conveyor again. During the interval of time required for cutting-off tread, the first three conveyor sections have been carrying the tread to the cutting-off machine at a constant rate. To prevent the rubber from "piling up" or being stretched just before the tread cutting process, the excess tread forms a loop between the third and fourth sections and controls the rate of speed of motor "E."

The hydraulic sensitive control on motor "E" is linked to an idler riding in the rubber loop. As the loop becomes longer the control moves down and gradually increases the speed of motor unit "E." When the last conveyor section is again started it travels at a considerably higher rate of speed than the first three sections and picks up the loop of tread between the third and fourth sections. As the loop becomes shorter it gradually decreases the speed of motor unit "E" the proper amount to prevent stretching the rubber. This unique cycle is fully automatic, and thus, the production of rubber tubing is continuous.

Figure 6 illustrates a skim coat rubber calender equipped with a variable speed fluid power drive for operating four winder rolls, two being used alternately as unwind brakes, and one helper cooling tower drive. The two drives for winding the finished product are shown in the foreground; the cooling tower and calender drives are in the background. Unwind and rewind drives for the parent roll and slip sheet roll are mounted in back of the calender drive.

One variable displacement pump, with automatic pressure unloading control, driven by a constant speed electric motor, supplies fluid power to four constant displacement motors and one variable displacement motor. All of these motors are connected in parallel to the variable displacement pump. When the rubber calender is running the pump discharges sufficient oil at an adjustable constant pressure to supply all motors which are operating. One constant displacement motor is connected to the parent roll, another to the slip sheet roll and two others to separate rewind rolls. The variable displacement motor is connected to the cooling tower.

In processing, a fabric is first drawn through the calender rolls to rubberize one side. This product leaves the calender without going through the cooling tower and, while still hot, is rewound on a roll driven by a constant displacement motor. By gradually increasing the torque and gradually decreasing the speed of this motor as the roll increases in diameter, a preset tension is maintained on the product constantly. This is accomplished automatically and steplessly by varying

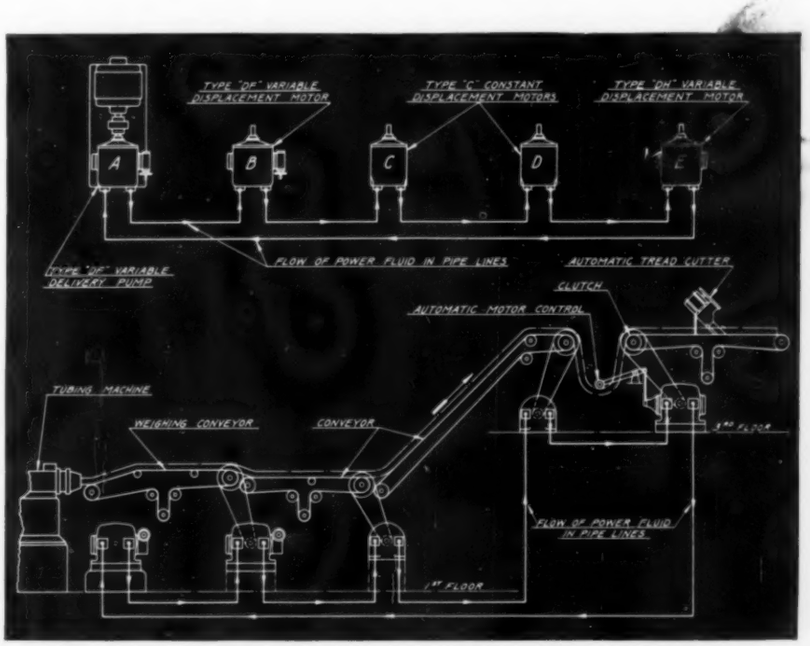

FIG. 5—Diagram of a variable speed fluid power drive for a tread tubing sectional conveyor extending over several floors. Four separate conveyors carry a continuous extruded flat rubber strip from the tubing machine (at the left) to a cutting-off machine (at the right).

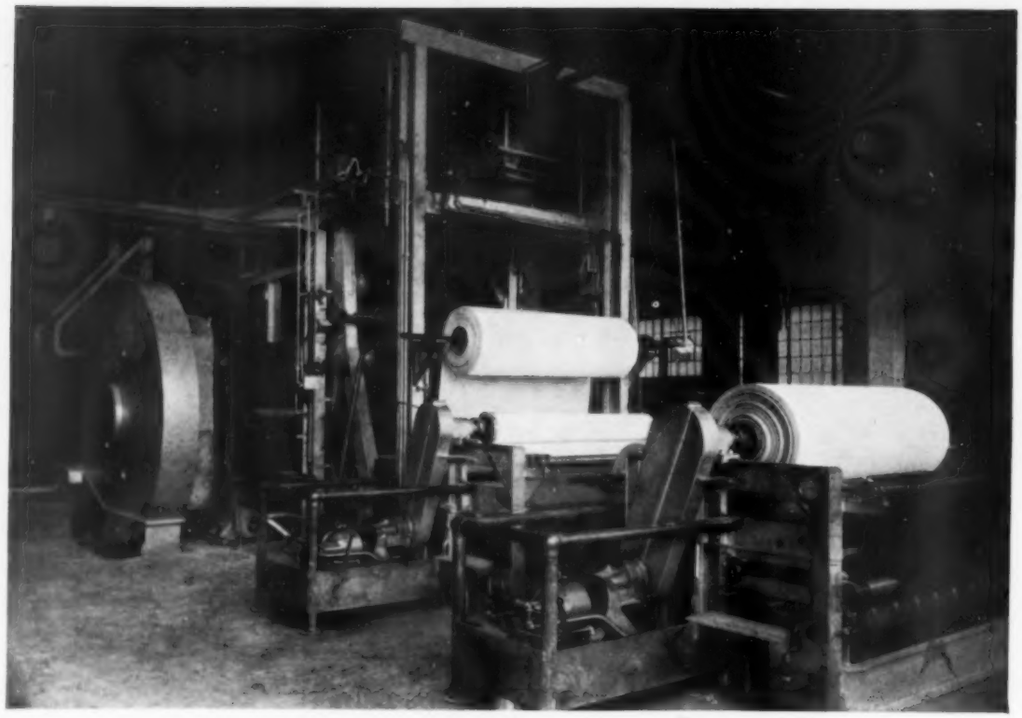

FIG. 6—A pump supplies fluid power to four constant displacement motors and one variable displacement motor to operate the four winder rolls, two being used alternately as unwind brakes, and one helper drive on this calender in the plant of the Gillette Rubber Co.
(All illustrations by courtesy of the Oilgear Company).

the pressure and volume available in the system through a pressure increasing valve adjusted by an idler riding on the circumference of the roll. Increasing or decreasing the lever arm of linkage connecting rider roll and increasing valve varies the tension on the product being wound.

Since this product is very adhesive, a slip sheet is wound on the same roll. As the slip sheet is drawn from its roll it drives a constant displacement motor as a pump. By gradually decreasing the braking torque and gradually increasing the speed of this pump as the slip sheet roll decreases in diameter, a preset tension is constantly maintained on the slip sheet. This, too, is accomplished automatically and steplessly by varying the pressure applied to the pump through a pressure reducing valve adjusted by an idler riding on the circumference of the slip sheet roll. Increasing or decreasing the lever arm of linkage connecting rider roll and reducing valve varies tension on slip sheet.

Thus with this equipment, the partially processed fabric and slip sheet are wound on a roll at a preset constant tension so it is not necessary to have the slip sheet treated against sticking. The low controlled tension on the sheet as it is rubberized does not allow the rubber to impregnate the liners to the extent that it causes additional tension when removing the rubberized fabric from the liners further along in the processing. On installations using other drives it has been found necessary to use a treated liner for this particular purpose. Independent adjustment is provided for varying the tension on the rubberized fabric and slip sheet. Both drives are equipped with control valves to start, stop, and reverse them in synchronism.

After the fabric has been rubber calendered on one side, it is threaded through the calender again to be rubberized on the opposite side. For this operation the control valves are shifted so that the motor on the unwind roll acts as a brake, while the other motor drives the slip sheet roll. The partially rubberized fabric drawn from the roll by the calender drives its constant displacement motor as a pump. By gradually decreasing the braking torque of this pump in the same manner as previously described for the slip sheet roll, when unwinding, a constant tension is maintained on the product as it enters the calender rolls. At the same time the slip sheet is rewound at a constant tension in the same manner as previously described for the product rewind drive.

Hot rubberized fabric from the calender is carried through the cooling tower on rolls driven by a variable displacement motor. The frictional losses are assumed to be practically constant and therefore a constant pressure applied to this motor by the pump will maintain a constant tension on the rubberized fabric coming from the tower. The torque and hence the tension on the rubberized fabric can be adjusted by varying the displacement of the motor.

As the finished product leaves the cooling tower it is wound in combination with a slip sheet at a preset constant tension in rolls of approximately 30 inches diameter. Two rewind drives, equipped with individual constant displacement motors, pressure increase valves, and stop valves, are used alternately for this operation. When one roll gets to be 30 inches in diameter the material is cut and wound on the other drive. Three or four rolls of finished material are obtained from one parent roll of semi-finished fabric.

When the current to the main drive motor is cut off a solenoid operated valve on the pump base closes, shutting off the supply of fluid power to motors driving rewinds and also applying a hydrodynamic brake to the motors operating as unwind units. As the calender comes to rest quickly the material acts as a brake to stop the rewind rolls, and the hydrodynamic brake maintains tension on the unwind rolls during the idle period.

Space will not permit descriptions of other drives performing unique functions in rubber factories, many of which involve the processing of highly inflammable materials requiring remote mounting of the pump, an electric prime mover and switches. However, the two drives described will no doubt suggest to those familiar with rubber processing, the wide scope of fluid power application in the rubber industry.

Rubber Division, A. C. S. to Meet at Detroit

Eight Papers Are Scheduled for Presentation; Round Table on Automotive Rubber to Be Held

The Book-Cadillac

THE Spring Meeting of the Rubber Division, A.C.S., will be held at the Book-Cadillac Hotel in Detroit, Michigan, on Monday and Tuesday, March 28 and 29. Eight technical papers will be presented at the afternoon session on Monday. Tuesday morning will be devoted to a special round table on "The Use of Rubber in the Automotive Industry." Dr. A. R. Kemp, of the Bell Telephone Laboratories, chairman of the Division, will preside at this session which will be addressed by invited speakers and largely devoted to an open discussion of mutual problems.

The banquet, for which elaborate entertainment is being arranged, will be held on Monday evening, in the Ballroom of the Book-Cadillac. Delegates to the meeting will have a choice of visiting four different plants in the Detroit area. These visits, which will be made on Tuesday afternoon, include the following: the assembly line of the Plymouth Motor Division, Chrysler Corporation; the steel mill of the Ford Motor Company; the research laboratories of the General Motors Corporation; and the tire and automotive division of U. S. Rubber Products, Inc.

One of the highlights at the meeting will be a report from the Division's Crude Rubber Committee, now headed by Dr. R. H. Gerke, General Laboratories, United States Rubber Products, Inc., Passaic, N. J. As previously revealed, this Committee has been working for some time to arrive at various standards which may be applied to raw rubber. In this regard, the viewpoint of both consumer and producer of crude rubber must be considered. A feature of the Committee's report, therefore, will be a general discussion on some questions raised by Far Eastern producers which have been transmitted to it for consideration. The specific questions which will be presented at the meeting for open discussion, so that the viewpoint of members of the Rubber Division can be secured, follow:

(1) What is the actual extent of the range of variation in quality of output (of crude rubber)?

(2) What is the quantitative distribution of the output over that range of variation?

(3) What are the consumers' requirements with regard to the properties considered desirable by different types of consumers?

(4) What is the range of variation about the specified requirement which would be tolerated by the consumer in each case?

(5) In what proportions would the different types to be specified in accordance with 3 and 4 be required?

(6) What are the methods to be used for specifying the properties referred to under 3?

It should be emphasized that all of the above questions pertain only to ribbed smoked sheet No. 1. It is understood that if consumers of crude rubber can agree upon the answers to questions 3, 4, 5 and 6, then the producers in the Far East would seriously consider investing the time and money required to find the answers to questions 1 and 2. It is also believed that the producers are not primarily interested in such general problems as color, thickness, regularity of sheet, etc., but are desirous of securing such laboratory standards as plasticity measurements in a plastometer, bomb-aging tests, etc.

The Crude Rubber Committee is anxious to secure the reaction of members of the Rubber Division to these questions for obvious reasons and a lively session is anticipated. The thoughts of every rubber chemist in the industry will aid materially in the proper solution.

Elsewhere on this page will be found a complete official program of events for the meeting. Titles, authors and their company affiliations, and abstracts of the technical papers, follow:

Program of the
RUBBER DIVISION, A.C.S.
March 28-29, 1938
Book-Cadillac Hotel, Detroit, Michigan

Monday—March 28

9:30-10:30 A.M.—Registration.
10:30-12:00 Noon—Crude Rubber Committee's Report.
12:00 Noon—Meeting of the Executive Committee.
1:30-5:00 P.M.—Technical Papers.
6:00 P.M.—Cocktail Hour.
7:00 P.M.—Banquet and Entertainment at the Book-Cadillac.

Tuesday—March 29

9:30-12:00 Noon—Round Table on "The Use of Rubber in the Automotive Industry," featuring short talks by automotive engineers.
12:00 Noon—Business Meeting.
1:30 P.M.—Visits to plants in the Detroit area.

Abstracts of Papers

(In Order of Their Scheduled Appearance)

Oxygen Pressure Aging. I. Improved Equipment. ***By L. M. Freeman (B. F. Goodrich Co.).***

An improved oxygen pressure aging apparatus is described. The improvements are as follows: (1) Small, stainless steel, quick closing jacketed pressure vessels which are easily removable from the system for repair purposes and can be operated singly or in series; (2) An electrically heated, constant temperature system which can be adjusted to maintain a constant temperature in the pressure aging vessel at 70° C. The constant temperature system is readily adjustable to a wide temperature range depending on the liquid used for the heat transfer; (3) A valve which automatically closes the oxygen supply to the pressure vessel if the safety releases. This conserves oxygen and prevents loss of tests in other pressure vessels attached to the same oxygen supply; (4) A simple, easily operated safety release.

Statistical Theory of the Elasticity of Natural and Synthetic Rubber. ***By Eugene Guth (University of Notre Dame).***

The high elasticity and the anomalous thermoelastic behavior of rubber are explained in terms of the molecular structure of rubber without making any arbitrary assumptions. Rubber consists of long chain molecules, which, in the unstretched state, are in a more or less curved form due to the possibility of free rotations around a single bond in the single chains. This curved form is the most probable one according to the statistical interpretation of the second law of thermodynamics. On applying stress these curved molecules will be stretched, thus giving a transition to a less probable state. On releasing the stress, the heat motion causes a traction. Rubber elasticity is then analogous to the elasticity of a gas.

A second statistical or entropy effect involving elasticity arises from the possibility of restricted "free rotation" of the single chain molecules as a whole. The inner and intermolecular forces which alone had only a normal thermoelastic behavior can be taken into account in a manner analogous to that employed in the transition from an ideal to a real gas. It is very important both for technological and theoretical work on rubber to know the thermal state equation of rubber, *i.e.*, the dependency of the stress from temperature and extension.

The typical differences in the elastic behavior of the different types of rubber (as for instance, raw and slightly vulcanized rubber; synthetic rubber) can be accounted for by the assumption that in the one, the "force", in the other, the "statistical" mechanism is predominating.

Effect of Ternary Mixtures of Zinc Oxide, Channel Black and Clay on the Physical Properties. ***By J. P. Marcelo, O. D. Cole and H. I. Cramer (Firestone Tire & Rubber Co.).***

Ternary mixtures of channel black, zinc oxide, and clay in rubber were studied. These ternary mixtures were found to have an additive effect upon the physical properties of the rubber. These results are similar to those previously obtained in studies of binary mixtures of pigments.

The Chemistry of Soft Rubber Vulcanization. VI. Reversion and Non-Reversion in Low Sulfur Compounds. ***By B. S. Garvey, Jr., and D. B. Forman (B. F. Goodrich Co.).***

A study of the behavior of ten accelerators in low sulfur compounds showed that they fall into two groups. The first group shows no vulcanizing action in the absence of free sulfur and gives, with low sulfur, reverting compounds which, after mill reclaiming, require the addition of sulfur to effect a new cure. The second group shows definite vulcanizing activity in the absence of sulfur and, with low sulfur, gives non-reverting compounds which after mill reclaiming can be recured by heat alone.

The theory is advanced that the vulcanized state may depend on the maintenance of an adequate number of cross bonds rather than on the permanence of individual cross bonds. In non-reverting, low sulfur compounds the number of cross bonds may be maintained by a sort of dynamic equilibrium between the vulcanizing action of the accelerator and the reverting action of thermal agitation.

Extraction of Water Soluble Accelerators in Water Cure. ***By J. W. MacKay (Monsanto Chemical Co.).***

Eight hours extraction using 160 liters of water did not remove 5.0 grams of piperidine cyclopentamethylene dithiocarbamate, or 10 grams of sodium mercaptobenzothiazole, from 1000 grams of rubber film. A similar quantity of 0.1% NaOH solution did not remove 1.0 gram of sodium pentamethylene dithiocarbamate or 10 grams of sodium mercaptobenzothiazole from the rubber. The extraction removed water soluble non-rubber constituents giving a softer rubber film. Water soluble accelerators have a selective solubility for rubber which is many times their solubility in water.

The Structure of Rubber in Solution. II. Colloidal Effects of Precipitants. ***By S. D. Gehman and J. E. Field (Goodyear Tire & Rubber Co.).***

The colloidal changes caused by the addition of precipitants to rubber solutions have been observed by viscosity measurements and measurements of the intensity and depolarization of the transversely scattered light, as a means of securing information about the colloidal structure of rubber solutions.

The light scattering measurements show that colloidal changes occur which are not apparent from the viscosity data. This is explained by the fact that the light scattering depends upon the geometry of the structure and the viscosity upon the potential energy in the structure.

The results are considered to be further evidence that, in rubber solutions, the rubber molecules exist in clusters or groups, the size, shape and "interlocking" of which depend upon the molecular forces in the solution.

Processing Characteristics of Rubber Compounds as Affected by Pigment Particle Size and Surface. ***By A. H. Nellen (Lee Tire & Rubber Co.) and C. E. Barnett (N. J. Zinc. Co.).***

The processing properties which any pigment may impart to a rubber compound are of considerable importance in determining the particular type of pigment which may be used most effectively and economically for any purpose. This question is considered as a function of the particle size and the nature of the surface of pigments. For zinc oxides of similar surface characteristics it was found that the tubing rate and plasticity increased with increasing particle size of the zinc oxide. Controlled variations in the surface of a zinc oxide at constant particle size produced very great differences in tubing rate and plasticity when the average particle size of the zinc oxide was about 0.20 micron but very little difference when the particle size was 0.40 micron.

Flocculation of Pigment in Carbon Black-Rubber Mixtures. ***By C. R. Park and Paul P. McLellan (Firestone Tire & Rubber Co.).***

A study has been made of the effect of heat upon the properties and structure of carbon black-rubber mixtures. Progressive stiffening is shown to accompany heating. Photomicrographs show in detail the progress of flocculation after successive periods of heating. The theories of Depew and Ruby and of Green, regarding the effect of carbon black flocculation upon stiffening, are indicated to be in agreement with these observations.

Rex Compounds

DEVELOPED primarily for use with latex, a line of special compounds has been developed by Leather Finish, Inc., 233 Commercial Street, Malden, Mass. Known as Rex Compounds, these compounds are intended for use in the saturation and stabilization of latex, as well as for use in latex compounds and naphtha rubber compounds. Mixed with latex, they are said to be especially suitable for coating and other purposes.

The Proteins in Preserved Hevea Latex

By C. Bondy and H. Freundlich

of the Sir William Ramsay Laboratories of Inorganic and Physical Chemistry, University College, London

HEVEA latex, the milky sap of *Hevea brasiliensis*, is a concentrated emulsion of rubber hydrocarbon in an aqueous solution which contains both colloidal and crystalloid substances *(1)*. Such concentrated emulsions are known to be stable only if a sufficient quantity of an emulsifying agent is present which, by coating the finely dispersed globules, prevents them from coalescing *(2)*. It has long been suggested that proteins, which are found in many latices, are adsorbed on the rubber particles and may, therefore, act as protective agents *(3)*. The importance of proteins for the colloidal behavior of *Hevea latex* was shown by a great number of experiments *(4)* which clearly proved that the latex had an isoelectric point so characteristic of protein coated surfaces, and furthermore that this isoelectric point (i.p.) was identical with the i.p. of the mixture of proteins in the latex *(5)*. Further evidence for the important part played by proteins in the stability of latex was furnished by coagulation experiments *(6)*, showing that many typical protein precipitants were very efficient coagulants for latex.

The proteins of *Hevea latex* have been the subject of numerous investigations which were, however, mainly concerned with the influence of the nitrogenous bodies on the manufacturing processes of rubber or the properties of the product ultimately obtained *(7)*. Although much work has been done regarding the coagulation of latex by modifying the protective protein layer around the rubber globules *(8)*, our knowledge of the proteins present in fresh or preserved *Hevea latex* still appears to be somewhat incomplete. With the exception of the extensive but mainly analytical work of Belgrave and Bishop *(9)* and a few papers by other authors *(10)*, no detailed account of the isolation and distinction of individual proteins of *Hevea latex* has come to the authors' attention. Our investigations, some results of which are communicated in this paper, were begun with the aim of filling this gap.

Experimental

A. The preparation of the serum.

Ammonia-preserved *Hevea latex* (p_H 9.7) with a rubber content of 38% was centrifuged until the concentration of the "skim" was less than 6 to 7%, this being achieved after about 20 hours. The centrifuge used had a mean diameter of 15 cm. and was running at a speed of 3000 r.p.m. The amount treated during one run was 800 cc. filled into four cups with a capacity of 220 cc. each. Little more than half the initial volume of liquid remained after the thick cream had been removed. The "skim" was then filtered through a porous pot of unglazed white china clay *(11)* with a capacity of 150 cc., as used in battery cells. The pot, soaked for two hours in boiling water, was fitted into a large filter flask by means of a rubber ring and filled with the liquid. The flask was then connected to an ordinary water pump. In order to facilitate filtration the inner wall of the pot, on which a thick deposit of rubber forms, was frequently rubbed with a rubber stopper on a glass rod. We thus obtained a clear, brownish serum without using any coagulants which had hitherto mostly been added. When studying proteins it is essential to avoid acids or alcohol, which may easily cause denaturation.

The total dry content of the serum was 3.4%. The non-diffusible nitrogen amounted to 0.021% which corresponds to a protein content of about 0.14%.

B. The isolation of the proteins.

1. Protein A.

The serum was adjusted to p_H 8 by neutralizing the excess of ammonia with dilute acetic acid. Into this solution half its own volume of a saturated ammonium sulphate solution was then stirred, the final p_H being 7.2. Voluminous flakes of a slightly brownish color separated, slowly rising to the top of the liquid. After about three hours, when the flakes began to settle, the precipitate was centrifuged off, resuspended in a 20% ammonium sulphate solution and centrifuged again. The protein was then redissolved in distilled water containing a trace of ammonia (it could not easily be dissolved in neutral solutions), and the operations of reprecipitation were repeated twice under analogous conditions. The protein thus purified and dissolved in dilute ammonia (p_H 8.5) was dialyzed in a cellophane bag for 24 hours against frequently renewed distilled water. A few drops of toluene were added as a bactericide. Thymol was found to be insufficient to prevent bacterial decay.

The solution was then transferred into an electrodialyzer of the Pauli *(12)* type and electrodialyzed until the current reached a constant value, usually about six hours, with a potential gradient of 45 volts/cm. During this time the current density fell from about 2 mA per sq.cm. to 0.3 mA per sq.cm. The membranes used were collodion at the cathode and collodion + gelatin, prepared according to Ettisch and Ewig *(13)*, at the anode. The p_H was constantly controlled and, during the first two hours, kept on the alkaline side by adding minute amounts of ammonia. The hydrogen-ion concentration was then allowed to increase slowly until it reached the final value of p_H 5.1.

Under the conditions prevailing at the end of the electro-dialysis, the protein, which will be referred to as protein A, is almost insoluble and is found at the bottom of the cell in the form of yellowish flakes. For the analysis it was washed with alcohol and ether and

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dried. For most other purposes it was dissolved in distilled water containing a trace of ammonia (p_H 8).

Protein A gives the usual violet biuret reaction and a deep red precipitate with Millon's reagent. Its nitrogen content is 13.8 ± 0.4% (Kjeldahl).

2. *Protein B.*

To the serum which has been freed from the bulk of protein A, crystals of ammonium sulphate are added so as to bring it to half saturation. A small amount of proteins, being a mixture of A and B, separates and is filtered off. The clear filtrate is then saturated with ammonium sulphate at p_H 7.0. Since the dense brown precipitate, which tends to adhere to the walls, separates rather slowly, the mixture is allowed to stand for about 24 hours before it is centrifuged. The sediment, which contrary to protein A readily dissolves in a neutral or even slightly acid medium, is purified in the same way as described for A. Its transparent brown solution is freed by filtration from impurities precipitated during electrodialysis. The protein, which will be referred to as protein B, is soluble in the absence of electrolytes (p_H ∞ 5.3 at the end of electrodialysis).

For preparing large amounts of B it is convenient to start from a serum obtained by coagulating latex with ammonium sulphate. Three parts of latex are mixed with one part of the saturated salt solution. The slightly opaque serum is filtered through ceramic filters and treated in the same way as described above.

Protein B shows a strong positive biuret reaction and gives, like A, a red precipitate with Millon's reagent. Its nitrogen content was found to be 15.2 ± 0.5% (Kjeldahl).

C. Properties of the proteins.

1. *Electrophoretic Mobility.*

A microcataphoresis cell with platinized platinum electrodes was used for these experiments. It consisted of a flat glass tube with elliptical cross section, to which glass stop cocks were sealed on at the ends. The electrodes, coiled platinum wires, were fused in, having a distance of 20 cm. from each other. In the center the tube was ground flat and polished, so that the whole depth of the cell (2 mm.) could be observed under a powerful objective lens. A cross mark ensured observations always being made at the same part of the cell. Readings were taken in 1/5 of the depth *(14)*. The cell was mounted horizontally on the microscope, whose tube too was in horizontal position. The current was never passed in one direction for more than 15 seconds, after which time it was reversed and the mobility in the opposite direction measured. No asymmetry, due to polarization or liberation of gas, was observed.

For determining the electrophoretic mobility we made use of the well known phenomenon that protein coated surfaces of microscopic particles such as quartz, zinc oxide and the like, exhibit practically the same electrokinetic behavior as the protein itself *(15)*. Quartz particles, having a mean diameter of 2 to 3 μ were used in our experiments. The solutions employed were Sorensen 0.01 n phosphate and acetate buffers (B.D.H.), with a protein content of 0.05 to 0.1%. The quartz was first added to the more concentrated protein solution which was then diluted to the required strength. The H-ion concentration was determined with a glass electrode. The mobility/p_H curves for the proteins are given in Fig. 1. A has an i.p. at p_H 4.55 ± 0.05, B at p_H 3.90 ± 0.05.

It is seen from the graph that the curves for A and B are very similar in shape but are clearly distinct

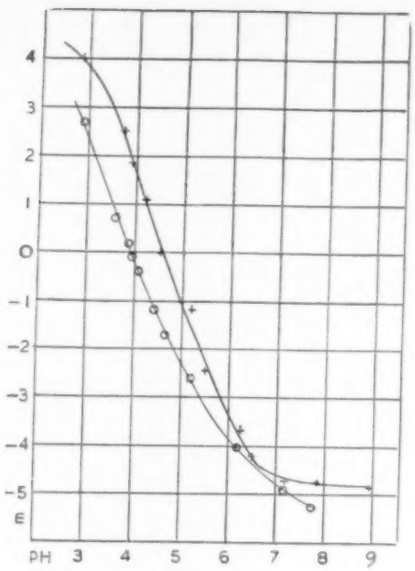

Fig. 1.

+ Protein A. ○ Protein B; m, cataphoretic mobility: μ | sec | volt | cm.

from each other. A comparison with the mobility curve for latex would, therefore, allow to decide, which of the proteins determines the electrokinetic behavior of the rubber globules.

In Fig. 2 the curves for latex and for quartz, suspended in solutions containing about equal amounts of protein A and B, are recorded. In the former experiments, one drop of latex was mixed with 2 cc. dialyzed serum and 8 cc. buffer solution. Thus it was possible to avoid the inconvenience of high rubber concentration, without, at the same time, diluting the solutions to the same extent with regard to the proteins.

Fig. 2 shows that the curve for quartz in the protein mixture very closely approaches the latex curve and holds an intermediate position between curves A and B in Fig. 1. The latex curve is almost identical with the curve for protein A from p_H 8 to p_H about 6. At p_H about 5.4 it has a point of inflection and with a second change in its slope at p_H about 4.4 joins very closely the curve for protein B. Similar curves were obtained by L. S. Moyer *(16)* with latices from American Euphorbiaceae (species *Esula*).

We do not believe that exactly the same mobility curves will always be found with *Hevea latex (17)*. On the contrary, it seems obvious that the electrokinetic behavior of the rubber globules must distinctly depend on the proportion of the proteins present in the latex. It was found in our experiments that this proportion is far from being constant, and the sample investigated was one comparatively poor in protein A. It seems, however, safe to assume that the mobility curves for *Hevea latex* will always be intermediate between the curves for A and B.

2. *Precipitation of the Proteins.*

It has become customary to distinguish proteins by their precipitation limits, *i. e.* the minimum concentrations of neutral salts such as ammonium sulphate or zinc sulphate, required to start and to complete precipitation *(18)*. The limiting concentrations of ammonium sulphate necessary for the precipitation of protein A from a 0.01 phosphate buffer were 10.7 to 14.0 g per 100 cc. (20 to 26% saturation, p_H 6.5 to 6.7). The corresponding figures for B are 32 to 43 g ammonium sulphate per 100 cc. solution (60 to 80% saturation, p_H

6.6 to 6.8). The upper limit is somewhat uncertain, because complete precipitation of protein B is a lengthy process.

Neither of the proteins is precipitated from 0.01 n phosphate buffers (p_H 7.8) by saturation with sodium chloride.

The solubility of the proteins strongly depends on the hydrogen-ion concentration. Both, A and B, are almost insoluble at their isoelectric points. A, moreover, once precipitated, does not redissolve in distilled water or neutral sodium chloride solutions, the addition of alkali being necessary to effect peptization ($p_H > 7.8$). Table 1 shows in a qualitative manner the influence of p_H on the solubility of the proteins.

Table 1

	Precipitate	
p_H	A	B
> 6.0	—	—
5.2	+	—
4.7	++	+
4.5	+++	++
4.2	++	++
4.0	+	+++
3.8	+	+++
3.6	—	++
2.9	—	—

Ethyl alcohol brings about flocculation of protein A, if present in concentrations higher than 60 to 70% (p_H 7.5), but less than 35% of alcohol causes the protein to separate from its solutions at p_H 6.5, if excess electrolyte has been removed by dialysis. PO_4'''-ion seems to have a peptizing effect since more than 60% alcohol is required to precipitate the protein from 0.05 n phosphate buffers of the same hydrogen-ion concentration.

Protein B is not precipitated by alcohol. Moreover, when dried, it is dissolved by 75% alcohol, especially, if the latter contains a trace of ammonia.

The influence of some "polar-nonpolar" liquids was also studied. It seemed interesting, as the coagulation of latices by these substances was recently described *(19)*. Most of the polar-nonpolar liquids found to be coagulants for latex in the paper, just mentioned, were also found to make protein A insoluble, when its solutions were shaken with one of these organic liquids as a second phase. Amyl alcohol was particularly active. The experimental conditions were chosen so as to resemble the conditions described in the paper just mentioned, *i.e.*, the solutions of A contained small amounts of ammonia and other electrolytes. The protein is strongly adsorbed at the interface, acting as a semi-solid emulsifier. When the emulsion ultimately breaks, the protein forms a thick film at the liquid/liquid interface. Nonpolar liquids, which do not act as coagulants for latices also do not show any marked action, when shaken with a solution of A; only a slight denaturation is frequently observed in long times. Hence, in this case of *Hevea latex* the coagulation by polar-nonpolar liquids is probably in part or mainly due to their behavior towards protein A. Protein B is not affected appreciably by polar-nonpolar liquids.

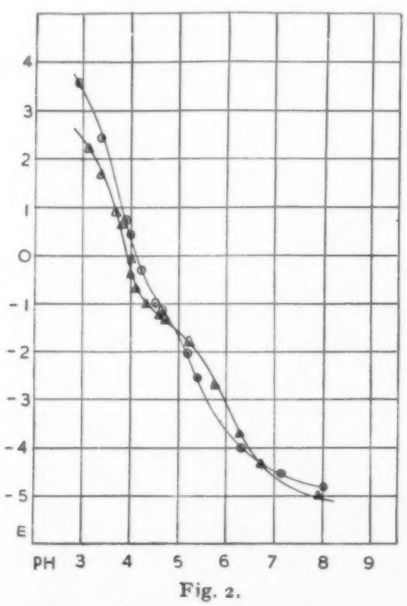

Fig. 2.

△ **Latex.** ○ **Mixture of A and B; m, Cataphoretic mobility: μ | sec | volt | cm.**

3. Gold Number

The gold number of the latex proteins could not be determined with great accuracy. This is due to the fact that both A and B exert but a feeble protective action on formol gold sols prepared according to Zsigmondy *(20)*. No concentration within reasonable limits could be found, where A prevented the color of the sols changing into blue, after the sodium chloride solution had been added. The blue sols, however, did not show any sign of further coagulation, if the amount of added protein exceeded 3 to 5 mg per 10 cc. sol. The gold number of B was found to be 0.4 to 1, but even at protein concentrations as high as 7.5 mg per 10 cc. a slight color change was observed. It is interesting to note that gold sols prepared by the phosphorus method, having much smaller particles, are completely protected against coagulation by comparatively small amounts of A or B (0.1 to 0.3 mg/10 cc.).

The affinity of the latex proteins to colloidal gold seems to be rather small. This is borne out by the fact that the gold particles are not carried into the interface, when the protein containing sol is shaken with chloroform according to I. Traube's *(21)* method. If gelatin is used as protective colloid, the aqueous phase becomes colorless on shaking with chloroform, because the gold is dragged by the gelatin into the liquid-liquid interface.

Discussion

It cannot, as yet, be ascertained, whether the proteins described in this paper are identical with those found in fresh latex. There is, however, some reason to believe that both A and B also occur in freshly tapped latex. Coagulation experiments in particular suggest that these proteins are the determining factors for the stability of fresh as well as preserved latex *(22)*. As an example Fullerton's *(22)* experiments may be quoted. He finds with diluted fresh latex complete dispersion from p_H 1.0 to 3.5, partial coagulation from p_H 3.5 to 3.8, complete coagulation from p_H 3.8 to 4.8, partial coagulation from p_H 4.8 to 4.9, decreasing flocculation from p_H 4.9 to 5.3, and complete dispersion at $p_H > 5.4$. Very similar results are given for preserved latex and could be confirmed by our experiments. Complete coagulation extends over the whole range of p_H between the isoelectric points of A and B and becomes less pronounced on the alkaline as well as the acid side of this range.

On the other hand, flocculation experiments with coagulants, other than acids, *i. e.* alcohol, neutral salts, polar-nonpolar liquids, etc., reveal a behavior which seems to be influenced mainly by the properties of protein A alone. Likewise, the electrophoretic mobility of latex particles is identical with that of protein A in alkaline solutions, and only at p_H 5.5, where aggregation commences, there is a break in the mobility curve for latex which now tends to approach the protein B curve. This fact and numerous observations re-

garding the flocculation and coagulation of latex suggest that normally, *i. e.* in neutral or alkaline solutions, the single rubber particles in latex are coated with a layer of protein A which is adsorbed in preference to the more soluble protein B. On the aggregates, however, which form at $p_H < 5.4$, there will be a surface layer consisting of a mixture of A and B, which over a certain range of p_H (4.5 to 3.7) exhibits the behavior of protein B.

Our results make it readily understood, why the proteins in *Hevea latex* favor, on the one hand, a concentrated emulsion of rubber particles, provided that the p_H and the electrolyte concentration is suitable; why, on the other hand, owing to the fairly hydrophobic nature of protein A, latex behaves as a somewhat hydrophobic suspension, when coagulated by polyvalent cations.

Other authors, when isolating proteins from *Hevea latex*, have usually adopted a different technique. It is, therefore, somewhat difficult to compare the results. Belgrave and Bishop *(9)* analyzed a protein obtained by precipitation at p_H 4.5. This was probably a mixture of A and B, since both are but sparingly soluble at this p_H (see Table 1). The substance, referred to as protein B in Bishop's *(9)* paper, may be identical with our protein B, whereas his protein C was probably a heat denaturated product.

The protein investigated by Kemp and Twiss *(5)* appears to have been a mixture of A and B but consisting mainly of A. Our experiments confirm their result that the behavior of the latex particles is mainly determined by a coating of protein, not of any other substance. But we consider it doubtful, whether their results allow a calculation of the fraction of latex-globule surface covered with protein till more is known about the adsorption of the proteins A and B in a mixture of both.

It has not been attempted to classify the latex proteins into any of the well known groups. Judging, however, from the solubilities alone, protein A will have to be placed into the glutelin or globulin group, whereas the alcohol soluble protein B might be labelled as a prolamin like gliadin. It remains to be seen, whether this view is confirmed, when the proteins are split into their aminoacids.

Summary

1. Two proteins were isolated from preserved *Hevea latex*.

2. The proteins were distinguished by their electrokinetic behavior and their solubilities in aqueous solutions and in alcohol. Protein A has an isoelectric point at p_H 4.55; it is insoluble in distilled water and alcohol. Protein B has an isoelectric point at p_H 3.9; it is soluble in pure water and strong (70%) alcohol.

3. A comparison of the electrophoretic mobility of the latex particles as function of the p_H with the corresponding curves of the proteins confirms the result of previous investigators that a coating of the rubber particles by proteins is decisive for their behavior. In a range of p_H between 5.5 and 8 the curve of the latex particles is practically identical with that of protein A.

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(14) Cf. for instance H. Freundlich: Kapillarchemie, Leipzig 1930; vol. I, p. 344.
(15) H. Freundlich and H. A. Abramson: *Z. physik. Chem.* **133**, 51 (1928); H. A. Abramson: *J. Am. Chem. Soc.* **50**, 390 (1928); G. Lindau and F. Rhodius: *Z. physik. Chem. A* **172**, 321 (1935).
(16) L. S. Moyer: *Amer. J. of Botany* **21**, 293 (1934).
(17) Cf. for instance I. Kemp and D. F. Twiss, loc. cit. (5).
(18) Cf. Allen's Commercial Organic Analysis, London 1913; vol. 8, p. 65.
(19) F. K. Daniel, H. Freundlich and K. Söllner: *Trans. Faraday Soc.* **33**, 890 (1937).
(20) R. Zsigmondy: Lehrbuch d. Kolloidchemie, 1. ed. 1912; p. 94.
(21) I. Traube and F. Rackwitz: *Koll. Z.* **37**, 131 (1925).
(22) Cf. for instance O. de Vries and N. Beumée-Nieuwland: *Arch. Rubbercultuur* **10**, 503 (1926); **11**, 518 (1927); **12**, 683 (1928); N. H. van Harpen: *ibid.* **11**, 487 (1927); **12**, 432 (1928); **13**, 61 (1929); R. G. Fullerton: *J. Rubber Res. Inst. Malaya* **2**, 156 (1930).

Your RUBBER RED BOOK

This column will appear from time to time and will contain changes or corrections which have come to our attention and which should be made in the 1937 Rubber Red Book Directory we recently published. By transferring the changes appearing in this column to their individual copies, holders of the Directory will have available correct data at all times.

Page 19: Buckeye Reliner Producing Co., Lima, Ohio. Officers should read: Pres. & Sales Man., Benjamin Rakowsky; Prod. Man. & Purch. Agent, Samuel H. Cohen. Add to products: All-Rubber and Radiator Hose; V-Belts.

Page 23: Customade Glove Co., New York City. Change address to: 445 West 31st Street.

Page 39: MacEwan and Smith, Inc. Change address to Doylestown, Penna.

Page 235: Under "Balata" listing add H. Muehlstein & Co., Inc., 122 East 42nd St., New York City.

Page 236: Under "Master Batches—Rubber and Carbon Black" add H. Muehlstein & Co., Inc., 122 East 42nd St., New York City.

Photoelastic Determination of Stresses

THE problem of the stress distribution around a rigid inclusion in a body under tension is of considerable interest in a number of fields, and yet there has been comparatively little work done on it. In the case of rubber the problem of the rigid inclusion is particularly important, not only for inclusions of appreciable size, but also with respect to microscopic and submicroscopic filler particles. For the experimental solution of such stress problems the extremely useful method of photoelastic analysis has recently come into prominence. The necessary data is obtained by observing in polarized light the patterns observed when a transparent model is stressed. Extensive use of the method has been made with models constructed of glass, celluloid, Bakelite, and other materials, especially the organic plastics.

A previous investigation (Research Paper 751 of the National Bureau of Standards) indicated that some rubber compounds fulfill many of the requirements for a desirable model material. Therefore, a rectangular rubber model loaded in simple tension at two opposite edges has been used in a study of the stresses around a rigid circular inclusion with cemented boundary. The results of this study are contained in an article by W. E. Thibodeau and L. A. Wood in the March, 1938, issue of the *Journal of Research*. After discussing the fundamental principles, the article gives a detailed outline and illustration of the exact experimental procedure used for the solution of problems by this method.

The lines of stress, originally introduced merely as aids to the mathematical treatment of the theory of elasticity, are in this case actually traced out from observations of the interaction of polarized light with the stressed medium. By the application of graphical methods, the final results of the stress distribution are obtained from the data with a minimum of advanced mathematics. The method is useful when applied to problems in which there is doubt of the validity of the assumptions involved in a theoretical treatment, or problems in which the mathematical difficulty of theoretical treatment is excessive. The method can be applied to a material like rubber where stress and strain are not proportional, and even to a plastic material as well as to an elastic material.

In the present work the maximum stresses near the boundary of the disc are found to be about 50% greater than the average applied stress. The experimental results are compared with those given by a theoretical treatment of this problem, and quite satisfactory agreement is obtained.

Rubber in Compression

DETAILS of new methods of providing metal-backed rubber surfaces which have an increased resistance to abrasion and cutting, determined during tests conducted on behalf of the Rubber Growers' Association with regard to the value of rubber linings in wet ball mills in the cement and mining industries, have recently been made available. Although the results obtained during the tests were not encouraging enough to justify further development for either of the two industries mentioned, it is believed that the methods employed can be usefully applied in other directions.

In practice, the rubber is vulcanized to the metal and after vulcanizing the plate is bent in order to relieve the rubber covering of all tension due to contraction after vulcanization, and, in addition, to put the coating into a state of superficial compression. One method is to vulcanize the rubber-coated plates in the flat state in a belting press and then to curve them so that the rubbered side becomes compressed. The rubber coating may be applied in the ordinary manner by means of an intermediate layer of vulcanite. Alternatively, it is not necessary to have a layer of vulcanite adjacent to the metal face, as the bond of rubber to metal may be arranged by any suitable method, as by plating the metal surface with a suitable metallic deposit. This method may be applied to the coating of flat surfaces which may have the rubber coating in a state of compression. In this case the coating is vulcanized to the metal in a curved state having the rubber on the outer face of the curve. After vulcanization, the product is flattened in order to relieve surface tension and put the rubber into compression.

It was found that ball mill linings covered by the methods described had a high resistance to cutting, and that the cuts did not "gape" or tend to extend in length. Tests have indicated that rubber-lined plates made by the compression method will outlast rubber-lined plates made by other methods. It was also found, however, that for use in wet ball mills as used in the cement industry, there was little prospect of equaling a life of 18 months as commonly given by steel linings. The results of the tests are described by Colin Macbeth in the January, 1938, issue of the *Bulletin of the Rubber Growers Association*.

Rubber Trade in the Netherlands

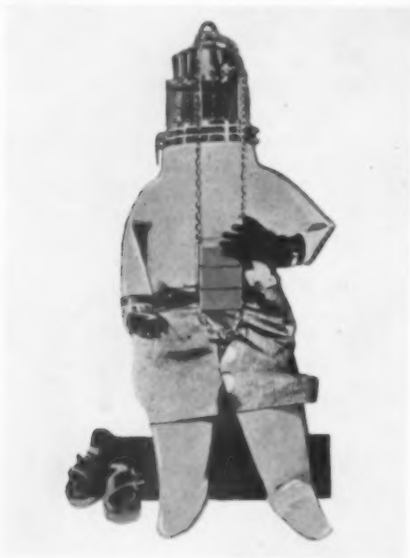
THE rubber industry of the Netherlands has developed along very healthy lines during the past few years, according to Canadian Trade Commissioner J. A. Langley, and although no remarkable increase has taken place in the number of factories, production figures have shown a steady upward trend. This particularly applies to the manufacture of bicycle tires and inner tubes, the domestic trade securing 82% and 78% respectively of the consumption. Although domestic production of tires and tubes is increasing, a very considerable quantity is still imported annually. Imports for the January-September, 1937, period, which amounted to 206,320 tires and 160,971 tubes, showed an increase over the same period of the previous year, while figures for the complete year of 1937 were expected to be considerably higher than the previous year. An analysis of the import figures for the first nine months of 1937 indicated increased purchases from the United States and Canada.

New Patching Material

A NEW black plastic compound, made with a latex base, which has adhesive properties and which can be manipulated or spread when applied, and dries tough, elastic and waterproof, has been developed under the name of Flex-O-Fix by the Frund Products Company, 43 East Ohio Street, Chicago, Ill. The new material may also be thinned for applying very thin coats by the addition of water. It is non-inflammable. Flex-O-Fix has a variety of uses. It can be used for electrical insulation, for setting glass, repairing umbrellas, tents, awnings, and tarpaulins, for repairing rubber and canvas hose, as a patching material for linoleum, for filling joints and general caulking purposes, for clothing and hosiery repairs, for repairing damages in rubber products, etc.

World's Strongest Diving Suit

WHAT is described as the strongest and safest diving suit ever built was used by Mr. M. E. Nohl recently in breaking the world's diving record. Mr. Nohl, who is 27 years old and comes from Milwaukee, descended 420 feet into the waters of Lake



Michigan, breaking the record by 110 feet. The suit was specially made by Collord, Inc., of Detroit, Michigan. In making it, a pattern was first formed from which a canvas foundation was cut and sewed. Rubber in solution was then applied on this foundation until a coating was formed measuring 1/16th-inch thick on the inside and 1/8th-inch thick on the outside, graduated to 1/4-inch on the shoulders and neck section. This method of construction resulted in a seamless and continuous rubber unit without a lap, welt or break from top to toe. Special care was taken with the suit since the pressure of water at a 420 foot depth is 181 pounds to the square inch. The record dive is said to have proved the feasibility of the proposed expedition to photograph the *Lusitania* which lies in 310 feet of water off the Irish coast as well as to open up fascinating possibilities in the salvaging of sunken treasure in many parts of the world.

Clearcarb—A Magnesium Carbonate

ANNOUNCEMENT has just been made of the development of a new magnesium carbonate, the use of which results in a practically transparent rubber. It is known as Clearcarb. Keasbey and Mattison Company, Ambler, Penna., has introduced this new form of magnesium carbonate, differing in crystalline structure from the conventional substance, and which is said to have the property of producing a greater transparency in rubber than has ever before been obtained.

Heretofore the magnesium carbonates used in translucent rubber processing were imported from abroad, but gross inequalities in the run of the material is said to have increased costs, impaired quality, and led to the search for a compound that would meet the standards of American manufacturers. Increased tensile strength and modulus is reported to be secured in rubber processed with Clearcarb, with a decrease in cost, in addition to greater transparency.

The translucent advantages are obtained through the construction of Clearcarb. It has a constant refractive index of 1.525, intentionally identical with that of pure vulcanized rubber. Under microscopic tests the crystalline structure of the new magnesium carbonate appears irregularly globular, whereas regular magnesium carbonate exhibits crystals of an elongated pattern.

Rubber products made with Clearcarb may be produced in colors at reduced costs because the greater transparency permits the use of a smaller portion of the expensive coloring pigments to get the desired shade in a given mix, according to Keasbey and Mattison chemists. The natural color of rubber produced with it is a clear, transparent amber. The exclusive distributor of Clearcarb is the American Cyanamid and Chemical Corporation, New York City.

Penetrols—Wetting-Out Agents

TWO new wetting-out and penetrating agents, said to be high in efficiency and low in cost, have been introduced under the name of Penetrols by the Beacon Company, 89 Bickford Street, Boston, Mass. These new agents are of particular interest to the manufacturers of paper for the impregnation of saturating papers, particularly latex-saturated papers, for removal of ink from old paper, defiberizing of lap pulp, cleaning of felts, wetting-out coating materials, and increasing the rate of removal of water from the fiber on the Fourdrinier. They may also be used in the manufacture of textiles, leather, metal cleaning and pickling compounds, etc. Two types have been made available. Penetrol-60 is described as being the more efficient of the two and to compare favorably with other materials in wetting-out and penetrating time, while Penetrol-65 is not quite as fast acting, although performing favorably in many applications.

Non-Skid Rubber Road Block

SAID to eliminate slipping, to have a service life of more than twenty-five years, and to be much more shock absorbent than any similar material, a new rubber road block has been developed in England by E. W. Coleman. The new block is studded with soft red and hard black rubber studs, the soft studs, which are slightly higher than the hard ones, spreading under compression to give two distinct grips, thus preventing slipping even under water. Although water acts as a lubricant to rubber, the arrangement of soft and hard rubber in the block is said to counteract the lubricating effect. The studs are set to the block at an angle of 10 degrees for the purpose of carrying any load and lessening the tendency to break off.

Metal Finish for Rubber

RUBBER parts are often given a metallic finish so that they harmonize with the metals with which they are used in special applications. A bronze lacquer for rubber, specially developed for this purpose, was recently introduced by the Maas and Waldstein Company of Newark, N. J. The new lacquer is said to make it possible to cover semi-stiff rubber with a strongly adherent, durable finish resembling brass, copper, bronze, aluminum, steel, or other metals. It consists of a special bronzing liquid to which metal powder of any kind is applied just prior to use. The mixture is applied by spraying and is said to air-dry rapidly.

New Equipment

Dead Weight Gauge Tester

AN improved model of the Amthor Dead Weight Pressure Gauge Tester, entirely new in design and construction, has been developed by the Amthor Testing Instrument Co., Inc., 10 Leo Place, Brooklyn, N. Y. It is intended for testing pressure gauges from 0 to 3,000 pounds. The outstanding feature of the improved tester lies in its construction. If the user has

an instrument with a capacity up to 300 pounds, he can increase the capacity to 1,500 pounds or to 3,000 pounds, or to any other desired capacity, merely by purchasing an additional piston of the required weights. The new tester, known as Type 452, is made of nickel-plated bronze and is firmly secured to a finished cast base. The necessary set of adapters and tools are supplied with each instrument, the entire unit being furnished in a carrying case or with a protecting cover when permanently installed. A separate metal container is supplied for the weights.

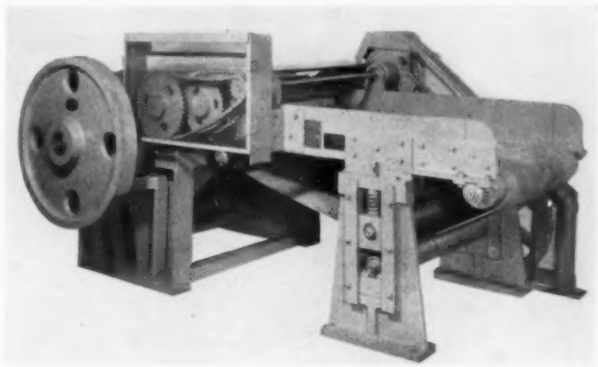
Stanley Keen-Knife

MADE from cast iron, perforated with holes for lightness, and finished with black japan, the Stanley Rule and Level Plant of the Stanley Works, New Britain, Connecticut, has introduced a new cutting knife for use with rubber, leather, paper, linoleum, and other materials. Known as the No. 1299 Keen-Knife, this cutting tool is equipped with a handle in which is

a compartment for the extra razor type blades used with it. In all, five of these blades are furnished with each knife. The handle consists of two halves held firmly together by a fastening screw. The perforations in the handle make for a good grip.

Taylor-Stiles Tire Chopper

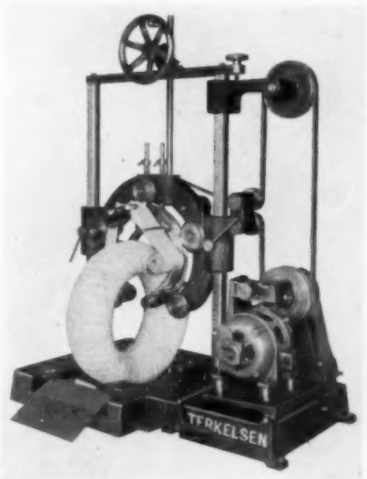
THE world's largest tire chopper, with a capacity up to 20 tons an hour as compared with the ordinary capacities of 5 tons an hour, was recently constructed by Taylor, Stiles and Company, Riegelsville, N. J. The outstanding feature of the new chopper lies in the fact that it takes in whole tires without folding, which means that it can be automatically fed. The tires are carried to a 36-inch wide throat on an



automatic apron feed and are then fed to revolving knives to be cut into thin slices. The chopper, which has a 50 h.p. motor connected to the cutter through a suitable coupling device, uses comparatively little power and is economical to operate regardless of the hourly tonnage, according to its manufacturers. Weighing 11,000 pounds, the new machine has a welded steel frame, and uses ball and roller bearings throughout. One of these giant choppers was recently installed in the Naugatuck (Conn.) plant of the United States Rubber Products, Inc.

Terkelsen Coil Wrapping Machine

DESIGNED to provide for the requirements of manufacturers who have a wide range of coil sizes which normally would require installation of two different sizes of the company's standard Model 4 wrapping machine, the Model 4-A wrapping machine



has been introduced by the Terkelsen Machine Company, Boston, Mass. Operation of this new machine for wrapping large steel and wire coils is convenient. No lifting of coils is necessary as they are rolled onto the feed rolls. When the coil is finished wrapped, it

may be taken out at the back of the machine, if desired, thereby providing continuous line production. The machine is operated by a foot pedal, leaving both of the operator's hands free for handling the coil. The starting and stopping mechanism consists of a foot pedal-lever for lifting the motor platform to bring the motor pulley into contact with a metal intermediate driver. Release of the pedal applies a brake, stopping the machine instantly. The coil feed rollers are of the "V" type. A feed roll trip pedal is provided so that the feed roll drive may be disengaged by the operator at will. The machine is driven by a 3 h.p. motor, the drive being of the friction type. Power is transmitted to the shuttle by means of a flat belt. A variable speed feed roll attachment permits a coil to be wrapped with any amount of paper as desired. It may be varied at will while the coil is being wrapped. The new wrapping machine, which requires a floor area of approximately 5 x 5 feet, will accommodate coils with 18 to 40-inch outside diameter, 12-inch minimum inside diameter, and circular cross-section or longest diagonal of rectangular cross-section not in excess of 10 inches.

Taber Portable Abraser

PROVIDING a standardized test for measuring the wear resistance of rubberized sheeting and other coated fabrics, the Taber Portable Abraser (Type J) has been developed by the Taber Instrument Company, North Tonawanda, N. Y. A cross-rub action of re-

silient wear composition discs produces a mild abrasive wear comparable to that encountered under actual service conditions. To conduct a test, a circular specimen is sheared from the sample with regular hand shears guided by templets, and a small hole is made in the center. The specimen is then clamped to the table of the abraser with thumb nut and washer. An adjustable clamping ring is provided for materials lacking sufficient rigidity to prevent wrinkling. Pivoted wear heads are then lowered to operating position, the counter reset, and the motor started. The end point of the test is reached when the instrument has produced sufficient wear to expose the fabric backing or to the extent where serviceability or appearance is seriously impaired.

To Owners of Noble's "Latex in Industry"

(Purchased Prior to November, 1937)

The author has prepared an addenda and errata list which represents not only errors in patent numbers and typography but which includes a number of references originally omitted from the book. This list, in printed form which may be readily pasted into the original copy, is available without cost. Address request to THE RUBBER AGE, 250 West 57th Street, New York City.

Booklets, Catalogs, etc.

The Effect of Various Accelerators with Various Sulfur Combinations on the Tear, Elongation and Hardness of a Gastex Compound. (Lab. Report No. 83). General Atlas Carbon Co., 60 Wall St., New York City.

Because of the interest shown by rubber chemists and compounders with the results of tests conducted to determine the effect of various accelerators with various sulfur combinations on the tensile, rate of cure, and modulus of Gastex compounds (Laboratory Reports Nos. 78 and 79), General Atlas pursued the study further. This latest report shows detailed information on tear, elongation, and shore durometer hardness for all compounds on all cures, original and aged 14 days in the Geer oven and also aged 96 hours in the oxygen bomb. In all, 11 compounds were given consideration.

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Warner Chemicals. Warner Chemical Co. Division of Westvaco Chlorine Products Corp., Chrysler Bldg., New York City. 5 x 6 in. 20 pp.

The chemical products marketed by the Warner Chemical Co., and also those of the California Chemical and National Kellastone companies, two other Westvaco divisions, are listed and briefly described in this catalog. Of interest to the rubber industry are the following products in the booklet: barium carbonate, blanc fixe, carbon bisulfide, carbon tetrachloride, caustic soda, sulfur chloride, trichlorethylene, magnesium oxide, and calcined magnesite.

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Index to A.S.T.M. Standards and Tentative Standards. American Society for Testing Materials, 260 S. Broad St., Philadelphia, Penna. 6 x 9 in. 128 pp.

This latest index gives information on all of the 823 A.S.T.M. standards as of January 1, 1938. It is of use to anyone wishing to ascertain whether the Society has issued standard specifications, test methods, or definitions covering a particular engineering material or subject and is of special help in locating the standards in the volumes where they appear. All items are listed under appropriate key-words according to the subjects they cover.

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Rex-Weld and Rex-Tube Insulated Steam Hose. Rex-Tube Metal Oil Hose. Chicago Metal Hose Corp., Maywood, Ill. 8½ x 11 in. each. 4 pp. each.

The respective merits of the company's lines of insulated steam hose and metal oil hose are described in these two bulletins. That devoted to steam hose indicates the construction of 14 different types, while the bulletin devoted to metal oil hose pictorially shows various uses in addition to indicating its interlocking construction. Additional information is furnished by both bulletins.

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Tag Celectray Pyrometers. (Catalog No. 1101D). C. J. Tagliabue Mfg. Co., Park and Nostrand Avenues, Brooklyn, N. Y. 8½ x 11 inches. 28 pp.

The special features of the Tag line of "Celectray" indicating, recording and controlling pyrometers, and resistance thermometers, which utilize a phototube, mirror galvanometer and a beam of light, are stressed in this new catalog. Illustrations clearly show the mechanisms of various models and provide quick understanding of the instruments' operations.

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Achievement. Monsanto Chemical Co., St. Louis, Mo. 8½ x 11½ inches. 12 pp.

The application of chemical engineering by Monsanto in the production of elemental phosphorus at its new plant in Monsanto, Tennessee, a development which led to the receipt by the company of the Bi-Annual Award for Chemical Engineering Achievement given by *Chemical & Metallurgical Engineering*, is described in this brochure. Several interesting illustrations are employed.

Technical Properties of Vulcanized Rubber. The Rubber Foundation, 182 Heerengracht, Amsterdam, Holland. 4¾ x 6 in. 24 pp.

As indicated by the title, this booklet describes the technical properties of both soft vulcanized rubber and hard rubber. Such properties as tensile, energy at break, permanent set, tensile fatigue, tear resistance, abrasion resistance, compression, hardness, aging and water absorption are discussed. The booklet does not attempt to cover the full subject, but merely to draw attention to the excellent and varied properties of vulcanized rubber in general terms.

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Natural Laws Applied to Production. Mathews Conveyor Co., Ellwood City, Penna. 8½ x 11 in. 32 pp.

Last year, Mr. F. E. Moore, president of Mathews Conveyor, sponsored a book entitled "Applying Natural Laws to Production." So great was the response to this book, that the company decided to enlarge upon the idea, the decision culminating in issuance of the present edition which is larger in format, revised, and includes illustrations, diagrams and other data. Of interest to production men, the publication shows how modern industrial organization is based on the principle of continuous flow.

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News About DuPont Rubber Chemicals. (Feb., 1938). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware. 6 x 9½ in.

This latest issue of the DuPont house organ contains a laboratory report and a reprint. The report is the second in the series of researches on the limitations of rubber, its full title being: "The Limitations of Rubber. II. Influence of Light and Ozone." It is termed Laboratory Report No. 38-2. The reprint is Part I of "Chemistry and You," a series of articles now appearing in *Popular Mechanics*, prepared by Dr. C. M. A. Stine, a DuPont vice-president.

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After Thirty Years. American Cyanamid Co., 30 Rockefeller Plaza, New York City. 8½ x 11 in. 28 pp.

The end of 1937 witnessed the 30th anniversary of the American Cyanamid Company. This booklet commemorates that anniversary. The development of the parent company, the acquisition of its many subsidiaries, brief descriptions of its various products, geographical location of its various plants, and a comparison of its financial standing at the end of 1936 with 1909 are the subjects covered in the booklet.

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Industrial Rubber Products. (Catalog D). Atlantic India Rubber Works, 1453 W. Van Buren St., Chicago, Ill. 8½ x 11 in. 34 pp.

Numerous mechanical goods with specifications and sizes that permit varied uses where rubber is required are illustrated and briefly described in this catalog, the purpose of which is to present as many staple articles marketed by the company as possible. Bumpers of all shapes and sizes, grommets, bushings, diaphragms, and various extruded rubber parts are shown.

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Tag Industrial Thermometers. C. J. Tagliabue Mfg. Co., Park and Nostrand Avenues, Brooklyn, N. Y. 8½ x 11 in. 24 pp.

This catalog contains conveniently arranged listings of the complete line of Tag industrial thermometers. The construction of these instruments is fully described and several illustrations show the various forms and connections that fit every application. Miscellaneous thermometers, hygrometers, U-gages, and other instruments, are also covered.

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Mac's Coal Directory and Buyer's Guide—1938. Coal Information Bureau, Inc., Union Trust Bldg., Pittsburgh, Penn. 9 x 12 in. $10.00.

The latest issue of this annual directory is divided into six sections, i.e., coal selling companies, operating companies, trade names of coal, coke plants, operating companies listed alphabetically by states, and a coal buyers' guide. It also includes a special directory and handbook of anthracite.

High-Speed Vulcanization of Rubber. By A. R. Kemp and J. H. Ingmanson. Bell Telephone Laboratories, Inc., 463 West St., New York City. 6 x 9 in. 20 pp.

Data on the temperature coefficient of vulcanization velocity and quality obtained at vulcanizing temperatures ranging from 170° to 198° C. is given in this booklet, a reprint from the July, 1937, issue of *Industrial & Engineering Chemistry*. This article is especially important in view of the fact that it is the first one published which concerns itself with the vulcanization of rubber at such high temperatures. It was originally presented as a paper before the Division of Rubber Chemistry, A.C.S., at the April, 1937, meeting in Chapel Hill, North Carolina.

Book Reviews

Asphalts and Allied Substances. (4th Edition). By Herbert Abraham. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York City. 6 x 9 in. 1515 pp. $12.50.

The first edition of this monumental work was brought out in 1918. The subsequent editions contained revised and additional data. This latest edition contains several new chapters on hitherto untouched subjects, while a special feature is a bibliography embracing more than 900 treatises. The scope of the latest edition may be more fully appreciated by the fact that there are more than 9,000 references to patents and approximately 3,000 citations to the general literature. Like previous editions, it presents full particulars about the natural sources or the industrial methods of production for each bituminous substance. Methods of testing and analysis of asphalts, tars and pitches and their manufactured products are covered. Processes using these materials for producing pavements, roofings, floor coverings, etc., are described. References to the use and manufacture of products made by blending rubber and latex with bituminous substances appear in several places in the book. The book should also prove of interest to rubber chemists because of constant references to compounding materials which are widely used in rubber manufacture as well as in bituminous products.

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Handbook of Chemistry and Physics. (22nd Edition). Edited by Charles D. Hodgman. Published by the Chemical Rubber Publishing Co., Cleveland, Ohio. 4 x 6½ in. 2090 pp. $6.00

The latest edition of this handbook, which has come to be recognized as a leader among reference works in chemistry, physics, mathematics, engineering, and related sciences, has been enlarged to 2090 pages and contains over 150 pages of new composition. In all, it has 173 contributors. Mathematical, general chemical, electricity and magnetism, and miscellaneous tables are included, as well as data on properties and physical constants, properties of matter, heat, sound velocity, quantities and units, etc. The book is compact and is bound in strong flexible fabrikoid. It is completely cross-indexed.

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Pahang. By Willard C. Bush. Published by the Macmillan Co., 60 Fifth Ave., New York City. 5½ x 8½ in. 284 pp. $2.50.

This book is a graphic account of the experiences of a young American on several rubber plantations in Pahang, the largest and probably the most primitive state of the Malay Peninsula. The multitudinous problems besetting the rubber planter, from plant disease to labor difficulties, are vividly described in the author's narrative, which is written in the first person. The picture drawn of the pestilence, labor riots, jungle dangers and other horrors, leads to the belief that the author's experiences occurred a good number of years ago. The book makes interesting reading, however, and should prove diverting to members of the rubber industry.

Editorial Comment

Extension of Restriction

RUBBER restriction under the current plan, which was launched in June, 1934, expires officially at the end of 1938. Already, the International Rubber Regulation Committee has proposed a five-year extension of the plan. There is little doubt that the extension will meet with the full approval of all signatory countries. The only difficulty seen lies in the reallocation of basic exports, since two or three of the signatories have intimated that they believe they should receive larger grants. Even this difficulty will undoubtedly be hurdled.

Viewing the operation of the restriction scheme for the past four years reveals that the Regulation Committee has been proceeding cautiously and has succeeded in almost all of its objectives. The chief defect in the plan would seem to be the lag between adjustments in shipments under permissible quotas and the international supply and demand situation. Past experience has indicated that this lag has often been so wide that before the effects of any movement to offset a critical condition could be felt a wide price fluctuation resulted, always a detriment to rubber manufacturers.

It seems reasonable to assume that if in the extension of the scheme, the Regulation Committee were to concentrate upon the maintenance of a reasonable reserve supply equal to approximately six months' consumption requirements (as it is at the immediate present because of current business conditions rather than by manipulation of the committee) at all times, then erratic price fluctuations, such as occurred in the past two years, might be avoided. It might also be possible, as suggested, to maintain a special reserve supply in major consuming countries which would be released only when shortages occur.

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Meeting of the Rubber Division

THE Rubber Division of the American Chemical Society holds its own meeting, exclusive of all other sections of the Society, at the Book-Cadillac Hotel in Detroit the latter part of this month, March 28 and 29. It is always good policy for the chemists, engineers, physicists, and others in the industry to attend the semi-annual meetings of the Rubber Division for a number of excellent reasons, which have been expressed time and again in these columns. The coming meeting, however, holds special interest for the industry.

In addition to the regular papers which are always part of these meetings, a special symposium on automotive rubber, addressed by invited guests, will be held on Tuesday morning, March 29. Since Detroit is the hub of automotive activity, it is safe to state that the symposium will hold special interest and will draw an unusual number of listeners. Secondly, a report will be made by the Crude Rubber Committee. As part of this report discussion will be invited on a number of questions raised by producers in the Far East with regard to possible standardization of crude rubber. Answers to these questions will be sought.

Because every rubber manufacturer is vitally concerned with crude rubber standards, this coming meeting is particularly important. Therefore, every rubber technologist is urged to make an effort to attend the conclave at Detroit.

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Burden of Taxation

THE burden of taxation borne by the consumer was brought home sharply by William O'Neil, president of the General Tire and Rubber Company, in a talk before the Advertising Club of New York last month. Making the statement that the public is not getting a true picture of the real conditions that exist, he cited as an example the recently widely quoted statement of Secretary of the Treasury Morgenthau to the effect that he was glad to note the low bids submitted to the government recently on its tire requirements and expressing the hope that the same low prices would be given the consumer.

"Surely he knows," said Mr. O'Neil, "that when tires are sold to the government it is not necessary to pay the 14% Federal tax that is assessed other tire sales, nor is it necessary to allow for the 24% that it costs the dealers to do business." If that 14% figure could be reduced, by the reduction of the excise tax on tires and tubes, for instance, then perhaps the consumer might get a lower tire figure. But with the government figuring out more taxes to raise more revenue, what can the tire manufacturer do but increase his retail prices—although the government will still get its low bids.

CURRENT • NEWS
of the Rubber Industry

MARCH, 1938

PROPOSE EXTENSION OF RUBBER CONTROL

Regulation Committee Sponsors Five Year Extension Plan Calling for An Increase in the Basic Export Quota and 2 American Delegates

A new plan calling for the continuation of rubber control for five years after the end of the current year has been virtually approved by a subcommittee of the International Rubber Regulation Committee and has been submitted for approval to the signatory countries, according to cable advices from London. The signatories have until June 30 to take a stand on the proposal after which, if they are not in accord, negotiations will be entered into.

It is understood that an increase of 12% in the basic export quota in 1939 is provided in the extension proposal. This would amount to 1,449,000 long tons as compared with the basic quota of 1,295,250 tons, exclusive of Siam, in the current year. The plan provides for a gradual increase in the succeeding four years, however, reaching 1,494,250 tons in 1943. The amount of rubber actually exported under these basic quotas would, of course, depend on the regulations set for each quarter of the year by the Regulation Committee.

Planting to Be Progressive

New planting, under the proposed extension, would be allowed up to 5% of the planted areas between January, 1939, and December, 1940, or approximately 400,000 acres. For the succeeding three years the committee would determine the additional amount of additional permissible planting, if any. The committee could also authorize an additional 1% of planting in 1939 and 1940 if it considered such an addition in the best interests of control.

Additional consideration is given to the United States under the terms of the new proposal. American manufacturers would have two representatives on the advisory panel in place of the one permitted under the current regulations, and the manufacturers' panel specifically would ask their advice on the subject of permissible shipments, new planting, and other points. The committee is said to be of the opinion that little difficulty to the proposed five-year extension will be encountered, but expects considerable difficulty on the reallocation of basic quotas among signatory countries.

For instance, both Ceylon and North Borneo have already asked for a larger share in total exports. The Dutch East Indies, after receiving one boost in its basic quota about two years ago, still believes that it is entitled to a larger share in order to increase the exports of native rubber. The question of native rubber continues to be one of the serious problems in the future of the restriction scheme. Special consideration will again have to be given to French Indo-China and to Siam, both having been subject to special rules in the last agreement. An agreement with Siam, however, is believed to have already been reached.

The current restriction scheme officially ends on December 31 of the present year. It has long been admitted that some extension of the scheme was necessary because of the wide disparity that still exists between world productive capacity and world consumption of rubber. The ability of the Regulation Committee to more or less control production and stocks has been indicated.

Rubber Imports Set Record

Imports of crude rubber into the United States during 1937, which totalled 600,476 long tons, established a new all-time high, according to the Leather and Rubber Division of the Department of Commerce. The nearest previous approaches to this figure were 565,087 tons in 1929 and 501,851 tons in 1931. The value of the 1937 imports was set at $248,266,584, a total exceeded only three times previously, in 1925, 1926 and 1927.

Preparing Wickham Biography

Edward N. Lane, of the London County Council, Bec School, Beechcroft Road, S.W. 17, London, England, is collecting material for a biography of the late Sir Henry Wickham, often termed the "Father of the Rubber Plantation Industry." Mr. Lane is interested in securing all available data on Sir Henry and would appreciate being furnished with any information by readers of this publication relating to his life and career.

COMMISSION CITES GOLF BALL MAKERS

All Respondents Ordered to "Cease and Desist" from Fixing Prices and Discriminating as to Prices to Certain of Their Customers

Eight leading golf ball manufacturers and their trade association, together with the Professional Golfers' Association of America and certain of its members, were ordered to stop fixing prices and discriminating as to prices to certain purchasers by the Federal Trade Commission on February 28. The order was the result of charges filed against the respondents by the F. T. C. last June.

The order prohibits all of the respondents from combining to fix and maintain uniform wholesale prices or resale prices in violation of the Federal Trade Commission Act; the respondent manufacturers from discriminating in price between different purchasers of golf balls of like grade and quality in violation of the Robinson-Patman Act; the respondent golfers' association and its members from knowingly inducing or receiving such price discriminations in violation of the Robinson-Patman Act; and the respondent manufacturers' association from contracting to pay and paying money to the professional group for the latter's promotion of the welfare and interest of its customers, who are also its members, in violation of the Robinson-Patman Act.

The Eight Manufacturers Cited

The manufacturers cited in the order are: A. G. Spalding & Bros., New York; John Wanamaker, Philadelphia; L. A. Young Golf Co., Detroit; Worthington Ball Co., Elyria; Wilson Sporting Goods Co., Chicago; U. S. Rubber Products Co., New York; Dunlop Tire and Rubber Co., Buffalo; and the Acushnet Process Co., New Bedford, Mass. These companies are said to control practically all factories in the United States manufacturing golf balls. The effect of their combined practices, according to the Trade Commission, was to "unreasonably suppress competition and bring about unlawful discrimination."

In its defense, the Professional Golfers' Association contended that the wide range of golf balls produced at various prices makes it impossible for any concern or individual to enjoy a monopoly in the field or to fetter competition.

KILCUP ADDRESSES R. I. RUBBER CLUB

Approximately 120 members and guests attended a meeting of the Rhode Island Rubber Club held on March 4 at the Narragansett Hotel in Providence. The Davol Rubber Company Glee Club, which includes E. L. Hanna, president of the Rhode Island group, among its voices, entertained with several selections before and after the first address of the evening. Before the speakers were introduced, F. E. Rupert (Anaconda Wire) invited all companies in New England with golf teams to get in touch with him regarding the planned annual golf competition. It was also suggested during the meeting that condolences be sent to the Los Angeles Rubber Group relative to the recent flood conditions in that city.

The first speaker of the evening was Mr. E. I. Kilcup, president, Davol Rubber Company. Taking as his subject "These Troubled Days," Mr. Kilcup's talk was an indictment against recent New Deal measures, which he termed "untested theories." He made no objection to the growing list of taxes, many of which he claimed were instituted not only to raise revenue, but also as punitive actions. He warned that the growing national debt must eventually be paid, and in this connection revealed that the Federal debt had increased from $1,193,000,000 in 1914 to the staggering total of $37,660,000,000 at the end of last month.

Consumer Must Carry Burden

Mr. Kilcup pointed out that no matter what refunding means the Administration, or future administrations, employs to repay the public debt, the consumer would have to carry the real burden either in plain or hidden taxes. Launching into another phase of "these troubled days," he blamed growing taxation, government interference in business, and government labor legislation for the current unemployment situation.

The Davol executive, who started with the company as an office boy, stressed the point that the answer to our current economical difficulties lies in immediate technical developments and improvements, a direct challenge to the country's chemists and technologists. In summing up, Mr. Kilcup said that it was time to be "less political and more patriotic, less critical and more constructive, and less conducive and more inducive in our thinking."

The second speaker was Mr. Harry Moulton, executive secretary of research, American Optical Company, who spoke on "Polarized Light and Its Applications." He explained the physics of light, and then reviewed the stages in the development of polarizing light from the crude experiments in the fifteenth century to the present day, citing inventors, dates and places. He emphasized the point that in polarized light, the light travels in one direction only, and demonstrated how polarization changes the intensity of light. He also demonstrated how different color effects could be secured by changing the intensity of polarized light and indicated how this phenomena could be applied to advertising purposes. Mr. Moulton concluded his talk with a demonstration of stereoscopic or three-dimensional colored motion pictures.

Coming Events

Mar. 28-29. Spring Meeting, Rubber Division, A.C.S., Book-Cadillac Hotel, Detroit, Mich.

Apr. 5. Los Angeles Group, Rubber Division, A.C.S., Mayfair Hotel, Los Angeles.

Apr. 8. New York Rubber Group, Building Trades Club, New York.

Apr. 18-21. Spring Meeting, American Chemical Society, Dallas, Texas.

April 22. Akron Rubber Group, Akron City Club, Akron.

Apr. 25-May 7. American Toy Fair, Hotel McAlpin, New York City.

May 6. Boston Group, Rubber Division, A.C.S., Boston.

May 23-25. Rubber Technology Conference, London, England.

June 27 - July 1. Annual Meeting, A.S.T.M., Chalfonte-Haddon Hall, Atlantic City, N. J.

Oct. 10-14. National Safety Congress, Hotel Stevens, Chicago, Ill.

Nov. 4. Boston Group, Rubber Division, A.C.S., Boston.

FILM IS FEATURE OF CHICAGO MEETING

Approximately 225 members and guests attended the first meeting of the new season of the Chicago Group, Rubber Division, A.C.S., held in the Hotel Sherman, Chicago, on February 18. The meeting was preceded by a dinner and floor show in the College Inn of the hotel as usual. Dr. C. E. Frick of Van Cleef Brothers was chairman of the evening. Members of the Chicago Section of the American Institute of Chemical Engineers were guests of the Rubber Group.

The feature event of the meeting was the showing of "Rubber Reborn," a motion picture taken in entirety in the plant of the Midwest Rubber Reclaiming Company, East St. Louis, Missouri. All details of the rubber reclaiming process, starting with the receipt of old tires at the factory, are shown in the film. William Welch, president of Midwest, introduced the film which received high praise from both members and guests.

The next meeting of the Chicago Rubber Group will be held sometime in April. Details can be secured from the secretary of the group, Ben W. Lewis, c/o Wishnick-Tumpeer, Inc., Tribune Tower, Chicago, Illinois.

KINCADE AND BURGER ADDRESS L. A. GROUP

Eighty members and guests braved the rain to attend the regular monthly meeting of the Los Angeles Group, Rubber Division, A.C.S., held in the Rainbow Room of the Mayfair Hotel in Los Angeles on March 1. Music was furnished by a cowboy quartet. During the meeting, W. R. Hucks (Goodrich) called attention to the value of chemical and technological articles published in the trade press and pointed out several such articles recently published which he considered especially worth reading. The matter of certain changes in the group's constitution was also discussed and it was decided to vote on suggested changes at the next meeting.

The first of three speakers was Harry L. Kincade, special representative, repair materials and services division, U. S. Tire Dealers Mutual Corporation, who discussed retreading in general and camelback in particular. He claimed that approximately 6,000,000 tires would be retreaded in this country during 1938 and that sales would undoubtedly set a new record despite current business conditions.

George J. Burger, secretary and general manager, National Association of Independent Tire Dealers, in Los Angeles on a coast-to-coast tour of major cities in the interests of the Association, was the second speaker. Discussing "What the Dealer Expects in Performance from Purchased Rubber Goods," Mr. Burger expressed the hope that camelback manufacturers would continue to improve their products and emphasized the danger of inferior products. He made a strong plea for reliable manufacturing progresses.

H. R. Thomas, deputy county public defender for Los Angeles County, the final speaker, discussed legal justice in general and pointed out that the prisoner before the bar is innocent until proved guilty. He said that the services of a defense attorney were permitted not with the thought of thwarting justice, but to see to it that the punishment meted out was no more than the circumstances merited.

The usual door prize, a leather brief case in this instance, donated by the C. P. Hall Company through Bob Abbott, was won by A. P. Kroeger (Monsanto), while the special prize, a smoking stand, donated by the Johnson Steel and Wire Company, was won by James W. Stull (Santa Fe Rubber Mills). Dinner favors—lip-sticks in beautiful cases—were donated by the Scovill Manufacturing Company through Garvin Drew.

Era at Upper Sandusky

The Era Products Company, which is scheduled to remove its plant shortly to Dundee, Michigan, is currently located at Upper Sandusky, Ohio, and not in Sandusky, Ohio, as reported in a previous issue of this publication. Upper Sandusky is located approximately 75 miles southwest of Sandusky.

AKRON RUBBER GROUP HEARS KIRKPATRICK

Sidney D. Kirkpatrick, editor of *Chemical & Metallurgical Engineering,* was the principal speaker at a meeting of the Akron Group, Rubber Division, A.C.S., held at the Akron City Club, on February 18. Mr. G. L. Allison, of Goodrich, acted as chairman of the meeting, which was attended by more than 200 members and guests. The speaker was introduced by Webb Jones.

Taking as his subject, "Chemical Engineering Comes of Age," Mr. Kirkpatrick pointed out how misunderstood chemistry was by the lay public and cited several examples to prove his point. Stating that chemical engineering as a science had made great strides since the first so-called course on the subject was given in 1888 at the Massachusetts Institute of Technology, the speaker quoted the definition of chemical engineering which was finally approved by the American Institute of Chemical Engineers several years ago. He revealed that chemical engineering registrations in schools and colleges in the United States had increased from 4,000 in 1924 to more than 10,000 in 1934.

Continuing, Mr. Kirkpatrick stated that the membership of the A.I.Ch.E. has increased from 220 members in 1917 to almost 2,000 in 1937, and that the output of the industries served by chemical engineering has grown from an annual value of four billion in 1917 to approximately eight and one-half billion in 1935. In concluding his talk, the speaker exhibited several products introduced in the past few years as a result of chemical engineering.

New York Group to Meet

The spring meeting of the New York Group, Rubber Division, A.C.S., will be held on Friday, April 8, at the Building Trades Club, 2 Park Avenue, New York City. Dr. Ernst A. Hauser will deliver a paper on "Structural Ideas on the Vulcanization of Rubber." Dr. Hauser delivered a similar paper before the group one year ago and the present paper is the result of work accomplished during the past year by Dr. Hauser and T. R. Brown, both of the Massachusetts Institute of Technology. In addition to this paper, a talking motion picture, "Rubber Reborn," revealing all of the steps in the production of reclaimed rubber, will be shown through the courtesy of the Midwest Rubber Reclaiming Co. William Welch, president of Midwest, will be on hand with others in the organization to answer any questions. Walter H. Grote, of the United Carbon Co., was scheduled to deliver a paper and also to perform some of his feats of legerdemain, but due to a business trip he will not be able to appear. Tickets to the meeting are available at $2.00 each, and can be secured from Peter P. Pinto, c/o THE RUBBER AGE, 250 West 57th St., New York City, secretary-treasurer of the group.

OFFICIALS OF SEIBERLING RUBBER ARE SHIFTED

J. L. Cochrun J. P. Seiberling C. A. Reed

With the relinquishing of his executive administrative duties as president of the Seiberling Rubber Company, Akron, to become chairman of the board, Frank A. Seiberling, often termed the "Little Napoleon" of the rubber industry caused several changes to be made in the executive personnel of the company. Under the new set-up, J. Penfield Seiberling, son of the founder of the concern, former assistant to the president and vice-president in charge of sales, assumes the presidency, while Col. J. L. Cochrun, assistant sales manager, becomes vice-president in charge of sales. Charles A. Reed, manager of commercial sales, succeeds Col. Cochrun as assistant sales manager.

Reorganization of the executive personnel of Seiberling Rubber comes as a climax to recurring rumors that Frank A. Seiberling would retire and was described by the retiring president as "the logical outcome of my decision announced several months ago to relinquish many of the administrative responsibilities which have been mine in the founding of the company." Mr. Seiberling, who was 78 last October, founded the Goodyear Tire and Rubber Company in 1898, guided the activities of that company until forced to retire by outside financial interests in 1921, and at the age of 61 founded the company which now bears his name. He is credited with the invention of the first tire building machines, the first straight side tire, the detachable rim with locking ring, and other important developments.

J. Penfield Seiberling, the new president, is 39 years old, a graduate of the Lawrenceville School, Princeton University and the Law School of the University of Michigan. He was employed as a Seiberling salesman in the early years of the company's development. Later, he served as vice-president in charge of sales for the Lambert Tire and Rubber Company, and returned to Seiberling in 1931 after Lambert sold its patent interests to that company.

Col. Cochrun, the new chief sales executive, is a graduate of Ohio Wesleyan and the Manilla Military Academy. He had a distinguished army career during which he received many decorations and served on General Pershing's staff throughout the World War. He first entered the rubber industry as a member of the truck tire sales department at Goodyear and has served in various capacities with Seiberling Rubber for the past 16 years.

Mr. Reed, the new assistant sales manager, was the first person employed by Frank A. Seiberling when he organized the company. He left Goodyear, where he organized and headed the stock clearance department, to head the service sales division of Seiberling, a post he retained until 1931 when the department was expanded to take on government and manufacturing sales and he was named commercial sales manager. L. M. Seiberling, son of C. W. Seiberling, vice-president and treasurer of the company, and one of its founders, has succeeded Mr. Reed as commercial sales manager.

Grant Tire Case Review

The Supreme Court on March 7 granted the petition of the Federal Trade Commission for a review of the decision dismissing the commission's order prohibiting the Goodyear Tire and Rubber Company from selling tires to Sears, Roebuck and Company at less than usual prices handed down by the Sixth Circuit Court of Appeals. The circuit court held that the commission's "cease and desist" order was "moot" in view of the fact that Goodyear had cancelled its contract with the mail order firm and that any possible future contract would come under the terms of the Robinson-Patman Act.

To Erect Rubber Pavilion

The Rubber Growers' Association of England will erect a rubber pavilion at the forthcoming Empire Exhibition to be held in Glasgow, Scotland. The story of rubber from the growth of the tree to its actual applications will be told by means of working machinery, models, illustrations and samples. Actual rubber products will be manufactured and distributed during the exhibition. A series of rooms, including nursery, bathroom and operating room, will be set up for the display of rubber products used in each type of room.

FINANCIAL NEWS

U. S. RUBBER SHOWS PROFIT OF $8,607,903

Based on net sales of $186,253,188, an increase of $25,892,162 or 16% over the previous year, the United States Rubber Company reports a net income of $8,607,903 for 1937, a decrease of $1,564,582 from the $10,172,485 reported in 1936. Net profit after all current charges except inventory adjustments and income taxes was $11,765,127. The 1937 income, after dividend requirements on the 8% non-cumulative preferred stock, amounts to $2.21 a share against $3.78 a share in the previous year.

Inventory adjustment amounted to $3,647,768, for which provision of $2,000,000 had been made in previous years and an additional $1,000,000 was set aside in June, 1937. The reduction in deficit for the year was $6,860,945, leaving a consolidated deficit of $10,471,627. The cost of taxes for the year amounted to $12,327,000, of which $6,480,000 constituted excise taxes on tires and tubes and $1,483,000 for social security taxes. Total salaries and wages paid during the year reached $52,298,000, the average number of employees being 37,109. Total wages paid were 25.9% more and total salaries 11% more than in 1936.

Consolidated Balance Sheet

The consolidated balance sheet shows total current assets of $90,309,834 and total current and accrued liabilities of $26,768,381, as of December 31, 1937, a ratio of 3.4 to 1. Outstanding funded indebtedness was $50,800,000, a reduction of $2,433,700 for the year. Interest on funded indebtedness was reduced from $2,848,577 to $2,574,353. At the end of 1937 the company had a total of 1,536,101 common shares outstanding with a net worth of $32,138,169, or $20.92 a share, excluding the value of good will, patents, etc., carried on the books.

Earnings of the United States Rubber Plantations, Inc., and subsidiary companies, which are not included in the report of the parent concern, amounted to $4,589,649, after provision for depreciation and amortization of $1,849,373. This compares with a net profit of $1,913,790 in 1936. A dividend of $100,000 was declared by one of the subsidiaries during the year in order to avoid tax penalties, leaving a net credit to surplus of $4,489,649. A plan is now being considered to simplify the corporate structure in regard to the plantations.

If feasible, U. S. Rubber Plantations, Inc., which owns all of the stock of the four foreign operating subsidiaries, and General Rubber Co., which owns all of the stock of the parent plantation concern, and is in turn wholly owned by the U. S. Rubber Co., will be dissolved and the four foreign operating subsidiaries will be owned directly by the parent corporation. If this plan is put into operation, earnings of the plantations will be consolidated with all other earnings.

A special meeting of stockholders has been called in Jersey City on March 31 to consider and approve the following plans: (1) Creation and issuance of bonds (up to a total of $75,000,000 at any one time outstanding) to be secured by a mortgage upon the property of the company and to be issued to refund outstanding bonds and for other corporate purposes; (2) Extension of the corporate existence of the company for 50 years from March 30, 1942; (3) Retirement of the preferred and common stocks held in the name of the Meyer Rubber Company (38,909 preferred and 81,588 common) and reduction of the capital stock of U. S. Rubber accordingly; (4) Change of the common stock to a par value of $10 a share and reduction of capital accordingly.

At present, U. S. Rubber's common stock is without par value. At various times in past years shares of common stock have been issued at prices ranging from $20 to $100. Changing these shares to a par value of $10 per share would create an aggregate par value for the 1,567,261 shares of $15,672,610. The company's capital would therefore be reduced to $80,781,710 (represented by both preferred and common shares) and a capital surplus of $85,222,791 created, since in January, 1938, the value of the common stock was carried at $100,895,401. From the created capital surplus it is proposed to write off the $57,662,405 of good will, patents, etc., to create a further reserve of approximately $11,000,000 against the idle plants no longer required for operations, and to liquidate other premiums and deficits carried on the books.

After providing for these items, a capital surplus of approximately $1,000,000 would remain plus net earned surpluses of subsidiary companies of $2,569,274. These figures are exclusive of surpluses on the books of the plantation companies. Removal of the deficits would open the way to resumption of dividend payments.

Baldwin Rubber Co.

4th Quarter: Net profit amounted to $73,957, after deducting all charges but before provision for the Federal surtax on undistributed profits, which is equivalent to 23 cents each on 316,757 shares of $1-par capital stock outstanding. This compares with profit of $66,162, or 21 cents a share, in the preceding quarter. Because company has changed its fiscal year to end on September 30, no comparison with the 1936 quarter is available.

GOODRICH REPORTS NET LOSS OF $878,580

Despite an increase in consolidated net sales from the $141,097,136 reported in 1936 to $149,971,715, or 6.3%, the B. F. Goodrich Company reports a net loss for the year of 1937 of $878,580, after provision for Federal income and undistributed profits taxes, and a $5,652,935 writedown to the December 31 market prices of raw materials on hand, on commitment, and material content of unfinished and finished goods on hand. This compares with a net profit of $7,319,507 reported for 1936.

The report shows profits of $4,900,355 for 1937 after depreciation and interest but before provision for Federal income and undistributed profits taxes, and inventory and commitment adjustments. Total current assets at the end of 1937 amounted to $75,428,910 against current liabilities of $14,107,700, a ratio of 5.3 to 1. Total current assets at the end of 1936 amounted to $82,276,928.

Monsanto Chemical Co.

For 1937: Net profit amounted to $4,898,309, after deductions for minority interests and provision for preferred dividends, equivalent to $4.40 a share on 1,114,388 common shares outstanding. This compares with earnings of $4,468,703, or $4.01 a share on 1,114,409 shares in the previous year.

Goodyear of Canada, Ltd.

For 1937: Consolidated net profit totalled $1,364,347, after all charges, equal to $4.14 each on 257,260 no-par common shares after provision for preferred dividends. Net profit in the previous year was $1,516,344, or $4.73 a common share.

Pharis Tire & Rubber Co.

For 1937: Net loss of $207,041, after all charges, including write-down of $189,000 in raw material inventory, raw material content of finished goods, and commitments to lower of cost or market at end of year. This compares with a net profit of $240,888 in 1936.

Raybestos-Manhattan, Inc.

For 1937: Net profit was $1,924,879, after all charges including provision of $150,000 for the surtax on undistributed profits, equal to $3.03 each on 635,500 capital shares, compared with net profit of $1,691,496, or $2.66 a share in 1936.

Hewitt Rubber Corp.

For 1937: Net profit of $270,423, after all charges and provision for surtax on undistributed profits, equal to $1.66 a share on the common stock, which compares with net profit of $255,448 for the preceding year.

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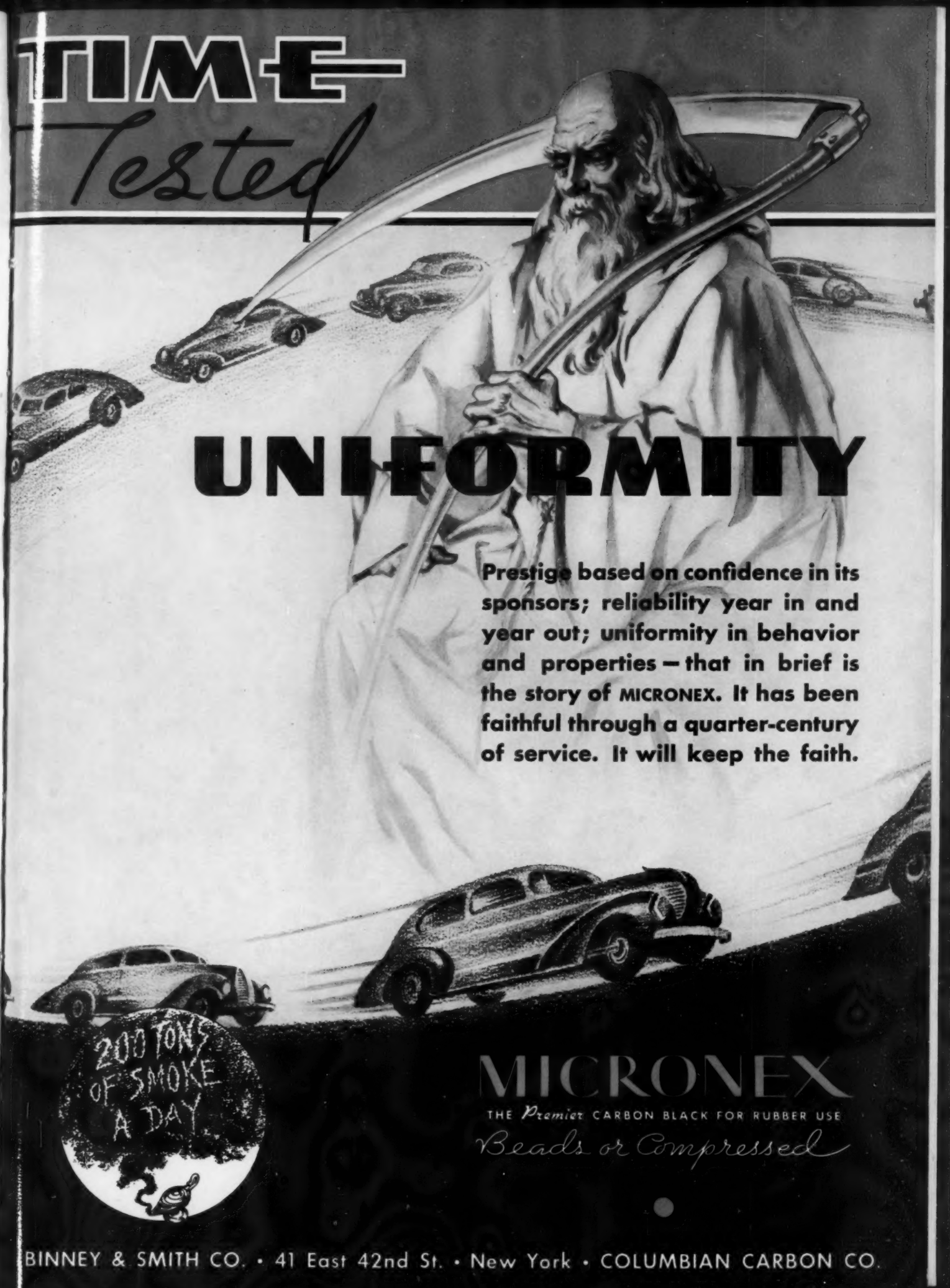
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UNIFORMITY
Prestige based on confidence in its sponsors; reliability year in and year out; uniformity in behavior and properties — that in brief is the story of MICRONEX. It has been faithful through a quarter-century of service. It will keep the faith.
200 TONS OF SMOKE A DAY
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THE Premier CARBON BLACK FOR RUBBER USE
Beads or Compressed
BINNEY & SMITH CO. • 41 East 42nd St. • New York • COLUMBIAN CARBON CO.

MICRONEX
Has Kept The Faith

1914-15—The World War, with upsets in all commercial lines. Carbon black beginning to be consumed in volume.

Micronex carries on in the face of increasing costs.

1919—The post war boom. New tire manufacturers entering the industry.

Micronex cooperates and is prepared to supply increased demand.

1922-23—Eight months of pronounced shortage.

Micronex fully protects all consumers.

1930—The great depression. Tremendous stocks in producers' hands.

Micronex makes outstanding progress in standardization and quality control, during period of declining prices.

1937—Consumption at record high, again passing production.

Micronex under heavy demand again meets all requirements with prompt deliveries of premier quality.

1938— *MICRONEX CONTINUES TO KEEP THE FAITH*

•

BINNEY & SMITH CO.

COLUMBIAN CARBON CO.

Binney & Smith
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MICRONEX MEANS MORE MILEAGE

GOODYEAR TIRE NET AMOUNTS TO $7,257,287

Goodyear Tire and Rubber Company, Akron, reports a net profit of $7,257,287 for the year of 1937, after depreciation, charges, underlying dividends, Federal taxes, and deduction of $10,342,743 to adjust inventories and commitments to the lower of cost or market values. This is equivalent to $1.94 each on 2,059,061 no-par common shares, and compares with a net profit of $10,831,032, or $3.68 a common share on the present capitalization, in the previous year. Earnings before adjustments were equivalent to $6.97 a share.

Consolidated net sales for the year were $216,174,513 as compared to $185,915,674 in 1936, an increase of 16%. Consolidated earnings from operations were $21,079,449 before interest charges and inventory adjustments, but after providing $8,010,178 for depreciation and $21,679,289 for taxes and duties of all kinds. Net consolidated operating earnings, after interest charges, amounted to $17,600,029, which, after adjustments, was reduced to $7,257,287.

The consolidated balance sheet, as of December 31, 1937, showed current assets of $108,635,091, including cash on hand and government securities of $11,612,064, as against current liabilities of $9,137,196, a ratio of 11.9 to 1. Inventory of raw materials and finished products, valued at the lower cost or market, amounted to $73,987,017. Tax payments on domestic operations for the year amounted to $12,799,801.

Rearrangement Program Completed

Goodyear's program of rearrangement of productive capacity and establishment of new plants, initiated in 1936, was substantially completed during 1937, financed entirely out of earnings. Net consolidated working capital, which amounted to $98,456,388 on December 31, 1935, rose to $99,497,895 by the end of last year. During 1937, the plan for the rearrangement of capitalization dated September 26, 1936, was also completed and the balance of the old $7 first preferred stock was retired by call. Conversions of the new $5 convertible preferred stock into common stock now total 90,596 shares. As a result of this and capital transactions of various subsidiary companies, all accrued preferred dividend liabilities were discharged and an annual reduction of charges prior to the common stock of $2,038,078, or approximately $1 per share of common stock outstanding at the end of 1937, was effected.

In a report accompanying the statement, President Paul W. Litchfield reviewed developments in recent years sponsored by Goodyear, including the introduction of the Lifeguard tube, the increasing use of Pliofilm, the Sure-Grip mud tire, the new Wingfoot Wall Rubber, and the introduction of Air-Foam. He also referred to the factors which hindered profits in 1937, such as labor disturbances in the automotive industry and the decrease in the value of raw materials during the latter half of the year. He admitted the "uncertainties of the immediate present" but predicted that Goodyear would share any upturn in the general economic situation this year.

At a meeting of the board of directors of the company preceding publication of the financial statement, George A. Sloan, head of the company bearing his name in New York City, was elected a director to succeed the late Newton D. Baker. Mr. Sloan is a former president of the Cotton Textile Institute and is a distributor of cotton, wool and rayon fabrics.

Galoshes for Cattle

A galosh type of rubber overshoe is being made by the firm of Bata in Czechoslovakia for use as a protection against hoof disease in cattle. Bata contends that use of the special galoshes will keep hoofs completely dry, thus warding off one of the diseases dreaded by cattle raisers. The galoshes are said to have been completely tested and to have proved satisfactory.

Brown Rubber Co.

For 1937: Net profit of $122,297 after all charges including provision for surtax on undistributed profits, equal to 61 cents each on 200,000 shares of $1-par capital stock. This compares with profit of $141,091, or 70 cents a share, in the previous year.

Discuss Fate of Aetna

An advisory committee to consider the affairs of the Aetna Rubber Company, Cleveland, Ohio, and to recommend changes, was recently appointed after a meeting of the company's stockholders. The committee, which included several stockholders, was to consider such questions as closing of the plant and liquidation of the business, sale of the business, obtaining additional working capital, change of management, and continued operation under the present management. Recommendations were to have been made by the committee at a stockholders' meeting on March 12.

Air Service to Akron

Direct air service between New York City and Akron was initiated on March 1 when Akron was added to the coast-to-coast airway operated by the United Air Lines. United's mainliners leave Newark Airport at 3:55 P.M. and are scheduled to arrive in Akron at 6:45 P.M., two hours and fifty minutes of flying time. All of United's planes operate on standard time. Air mail and air express service between New York City and Akron will also be speeded up by the addition of the "rubber city" to the company's schedule.

CONSUMPTION GAINS BY 1% IN JANUARY

Consumption of crude rubber by manufacturers in the United States during the month of January, 1938, is estimated to be 29,429 long tons, which compares with 29,160 long tons during December, 1937. January consumption shows an increase of 1% over December but 42.1% under January a year ago, according to statistics released by the Rubber Manufacturers Association. Consumption for January, 1937, was 50,818 long tons.

Gross imports of crude rubber for January are reported to be 42,135 long tons, a decrease of 38.3% under the December figure of 68,305 long tons but 28.4% over the 32,820 long tons imported in January, 1937.

Total domestic stocks of crude rubber on hand Jan. 31, are estimated at 269,078 long tons, which compares with December 31 stocks of 256,618 long tons and 204,201 long tons on hand on January 31, 1937.

Crude rubber afloat to United States ports as of January 31 is estimated to be 57,356 long tons which compares with 63,099 long tons afloat on December 31 and 55,096 long tons afloat on January 31 a year ago.

January reclaimed rubber consumption is estimated at 6,673 long tons; production at 8,467 long tons; and stocks on hand on January 31, at 27,179 long tons.

Warns Patent Infringers

In an open letter to the Lee Tire organization, A. A. Garthwaite, general manager of the Lee Tire and Rubber Co., Conshohocken, Penna., issued a warning to infringers of certain patents controlled by that company. According to Mr. Garthwaite, Lee Tire is the originator of tire carcasses which are built with so-called heat resisting cord manufactured by any method and is the owner of Reissue Patent No. 20,316 which covers the use of low stretch, low gauge, high twist cord in pneumatic tires. Therefore, Mr. Garthwaite states, the Lee Tire patent completely dominates any other patent along this line since the cord has no value until put into a tire carcass. He further claimed that all tires made with cord of low stretch, low gauge and high twist characteristics infringe the Lee Tire patent.

Chain Store Tax Bill

A bill calling for an excise tax on chain stores was introduced to Congress by Representative Wright Patman on February 14. Under the terms of this bill, the tax on chain stores would range from $50 to $1,000 per store and if chain stores operate in more than one state the tax would be multiplied by the number of states in which they operate. Filling station chains would be exempt from the bill providing they do not handle tires and tubes. The retail stores operated by tire manufacturers would, of course, come under the law.

WAGE REDUCTIONS ASKED BY GOODRICH

Warning the United Rubber Workers of America that further decentralization of Akron activities was essential unless the union agreed to accept hourly wage reductions of approximately 20%, T. G. Graham, vice-president of the B. F. Goodrich Company, in a recent statement, said that the move was necessary in order to place the company in a better competitive position. Proposed wage cuts for men ran from present averages of $1.10 to $1.15 an hour to 90 to 95 cents an hour, and for women from 70 to 75 cents an hour to 60 to 65 cents an hour.

In his statement, Mr. Graham implied that further decentralization by Goodrich would mean the loss of approximately 5,000 jobs to Akron. Telling of the decentralization that has already taken place and declaring that all other costs have been reduced as much as possible, the Goodrich executive said that "there is no alternative left, except to consider labor costs." A total investment of $15,000,000 in site, plant, machinery and moving would be required to remove 5,000 jobs from the company's Akron factories.

Other Assurances Wanted

In addition to the wage adjustments, Mr. Graham stated that the company wanted assurances from the union that would justify the company's appropriating several million dollars for modernization and expansion in Akron during 1938, as well as assurances that any equipment now installed or to be installed would be operated efficiently. A series of conferences between Goodrich and union officials followed Mr. Graham's statement. When the proposition has been reduced to its simplest form, according to one union official, it will be placed before the membership of the Goodrich local for a final decision. At this writing (March 9) no such point has been reached.

A somewhat similar state of affairs was experienced at the Trenton plant of the Thermoid Rubber Company earlier this month. After President Fred Schluter had advised the union that wage adjustments were essential if the company was to "stay in the market," the union voted to accept reductions ranging from two to three cents an hour for those in the lower income group to 5% for higher salaried employees. A proposal to strike against the proposed cuts was quickly voted down.

Goodyear and Firestone also figured in the labor news of the month. The U.R.W.A. filed a petition with the National Labor Relations Board on February 24 accusing Goodyear of discrimination against union members and of using various agencies, including the Greater Akron Association, to "publish false, untrue and inflammatory statements regarding the union." A petition filed with the board on the same date by the Firestone local asked for an election at that company's plants to determine the sole collective bargaining agency. Investigations are necessary before the board can hand down decisions on these petitions.

Invitations extended to Goodyear, Goodrich, Firestone, General and Seiberling Tire last month by the U.R.W.A. to attend a joint conference on labor-management problems were turned down by each of the rubber companies in turn, the consensus of opinion being that each concern preferred to deal with its own employees alone since the problems were specific rather than general in nature.

LOS ANGELES

A. P. Kroeger has been named manager of the recently established sales office of the Monsanto Chemical Company in the Standard Oil Company Building, 605 West Olympic Boulevard, Los Angeles. He was formerly connected with the San Francisco office and prior to coming to California had been stationed at the company's main offices in St. Louis, Mo.

Two fishing trips instead of only the one usually held during the summer months by members of the Los Angeles Rubber Group will probably result from an invitation extended to the Izaak Waltons of the group by E. Brazil, chemical engineer of the Blue Star Mines. The invitation called for a visit to the Owens Valley lakes which are said to abound in trout. Plans for the regular annual fishing excursion, generally sponsored by Ed Royal and held off the coast of San Diego, are being pushed.

Improvements in the plant of the D & M Machine Works, at Torrance, include enlargement of the capacity of the garden hose department to 12,000 feet of hose per 8-hour shift. New machinery, including two tubing machines and a mill, has already been installed.

Charles A. Lamb, vice-president, West American Rubber Co., Los Angeles, who has been ill for several months, continues to show improvement and should get back to activity shortly.

O'NEIL ADDRESSES ADVERTISING FORUM

Taking as his subject "Give Business Back to Small Merchants," William O'Neil, president of the General Tire and Rubber Company, addressed the advertising and marketing forum of the Advertising Club of New York, in New York City on February 18. In opening his address, Mr. O'Neil claimed that America is not getting a true picture through newspaper front pages of the real conditions that actually exist in the country today. In this regard he made the following statement:

"Secretary of the Treasury Morgenthau is quoted on the first page of most of the newspapers as saying that because tire manufacturers quote low bids for government tire contracts, that he hoped the same prices would be given to the ordinary consumer. He surely knows that when tires are sold to the government, it is not necessary to pay the 14% Federal tax that is assessed on other tire sales, nor is it necessary to allow for the 24% that it costs the dealer to do business."

"Everyone in Washington has been talking about prices being too high," said Mr. O'Neil. "That's not true as tires are selling for less money in the United States than in any other country in the world." He went on to cite other examples, including gasoline, and said that such unfounded statements "merely make it harder than ever to do business." He also stated that business is actually much better today than most people realize and that "it is only in a few industrial centers and right here in New York that business is not so good."

Defends Automatic Machinery

In concluding his address, Mr. O'Neil defended the use of automatic machinery in modern manufacturing and stated that if it were not for such machinery we would be paying from $5,000 to $17,000 for a Ford car that can be bought today for $500. He also said that automatic machinery had made it possible to put 55 pounds of rubber on popular-priced motor-cars today, while there was only 5 pounds, outside of the tires, on the cars of five years ago. "Automatic machinery and labor-saving devices have put to work eight times as many persons as were originally employed in making and distributing the same articles, when they were built by the old-fashioned methods," were the rubber executive's final words on the subject.

Mr. O'Neil was recently reelected president of General Tire for the fifteenth consecutive time. He has been president and general manager of the company since 1923.

INTERNATIONAL PULP CO., *41 Park Row, New York, N.Y.*
SOLE PRODUCERS OF PURE **ASBESTINE** SPECIALLY PREPARED FOR USE IN RUBBER
Covered and Protected by Letters Patent Registered at U. S. Patent Office, Washington, D. C.
LIBERAL WORKING SAMPLE FURNISHED FREE

MARTIN TIRES FILES FOR REORGANIZATION

The Martin Custom Made Tires Corporation, with headquarters in New York City and factory in Salem, Ohio, filed a petition for reorganization under Section 77B of the Bankruptcy Act in the United States District Court for the Southern District of New York on February 14. The court issued an order continuing the corporation in possession of its properties and authorizing it to continue its business. A hearing was set for March 16 before Hon. William Bondy in room 905, United States Court House, Foley Square, New York City, to determine whether to continue the corporation in possession or appoint a trusteeship.

According to James Martin, president of the concern, the action for reorganization was taken in the best interests of both creditors and stockholders, and was attributed to several factors including the following: (1) A large percentage of the tires made for the company by several tire manufacturers until 1937 were defective, causing substantial losses; (2) the expenditure of a large sum to equip and operate the company's recently acquired factory at Salem, Ohio; (3) failure of the anticipated large sale of new preferred stock due to unfavorable business and stock market conditions; (4) sharp drop in the price of rubber and other raw materials; and (5) the business recession.

At this writing a creditor's committee has been partially organized and is said to represent companies whose combined interests amount to approximately 40% of the outstanding unsecured indebtedness of the Martin concern. This committee includes D. K. McCall (Marlboro Cotton Mills), Joseph Davies (Charles T. Wilson), and Morris Barbenell (Hermann Weber). S. J. Pike, Jr., of T. A. Desmond & Co., Inc., 33 Rector Street, New York City, is chairman of the committee.

Introduce General Dual 8

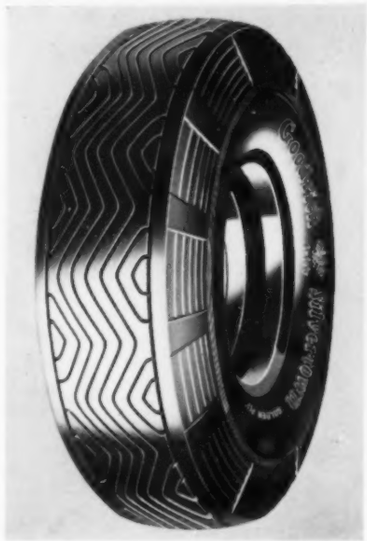
To meet the demand from owners of smaller cars for a tire with the "squeegee tread" of the multi-vaned Dual 10 tires featured by the General Tire and Rubber Co., Akron, the company has developed the General Dual 8. Like the bigger tire, the new Dual 8 is built from long fibre fabric stock and has the same distinctive tread of narrow vanes of rubber which squirm into a serpentine shape when braking pressure is applied. The new tire is available in both white and black sidewall types.

Safety Convention Planned

The Ninth Annual Convention of the Greater New York Safety Council will be held on April 19 to 21 at the Hotel Astor in New York City. A total of 35 sessions on all phases of safety, requiring 162 speakers, has been arranged. No special program on rubber safety, however, is part of the general program.

Goodrich Non-Skid Tire

B. F. Goodrich Co., Akron, Ohio, has just announced a new passenger car tire under the Silvertown name featuring white sidewalls and a new



New Silvertown Tire

tread design called the "Life-Saver" tread. The new tread design, said to be revolutionary in nature, is designed to give unusual traction and braking effectiveness. According to Goodrich engineers, the new tire will stop an automobile on wet pavements quicker than any tire ever built. Tests conducted by the Pittsburgh Testing Laboratory resulted in a report that the new tire "gave more non-skid mileage than any other tires tested in its own price range and averaged 19.1% more miles before the tires wore smooth."

William J. Kent

William J. Kent, an inventor in the development department of the mechanical goods division of the U. S. Rubber Company for 31 years until his retirement on pension in 1931, died at the age of 77 at his home in Hickory Bluff, Conn., on March 2. Prior to joining U. S. Rubber at the turn of the twentieth century, Mr. Kent invented an air cushion pad for horses which was widely adopted by police and fire departments throughout the country before motorization set in. During the World War he designed a special boot for cavalry and artillery horses at the request of the War Department. The boot prevented mustard gas from seeping through and destroying the usefulness of the horses. While with U. S. Rubber he invented and patented many products for automotive use, all of which were assigned to the company. Mr. Kent was born in Brisbane, Australia, and came to this country at the age of 20. Funeral services were held in Norwalk, Conn. He leaves a widow, son and daughter.

"Rubber Reborn" Shown

The first showing in the East of the talking moving picture, "Rubber Reborn", produced by the Midwest Rubber Reclaiming Company, was made on February 28 at the Waldorf-Astoria Hotel, New York City, before an audience of local technologists, representatives of chemical concerns, and other reclaimers invited through the courtesy of William Welch, president. The picture was produced under the personal direction of Mr. A. O. Fuhrmann, chemist of the Midwest company, under the guidance of Mr. Welch, both of whom were present at the showing. Mr. Harry Knight, a director of the company, was the only other firm representative present.

As its name indicates, "Rubber Reborn" tells the story, in pictures and running comment, of how reclaimed rubber is produced—from the gathering, sorting, and chopping up of the scrap, through the various rigidly controlled operations, to the finished product. It gives an excellent insight into the care taken in each step and is a revelation to those who have never been through a modern reclaimed rubber factory. The audience present was greatly impressed by the thoroughness of equipment and methods used in the Midwest plant as well as by the technical excellence of the picture itself. Those desirous of seeing this worthwhile picture will be able to enjoy it at the next meeting of the New York Rubber Group to be held on Friday, April 8. (Details of this meeting will be found elsewhere in this issue.)

Canadian Group Meeting

A. E. Warner, formerly chief chemist of the Firestone Tire and Rubber Company, and now associated with the C. P. Hall Company of Akron, was the principal speaker at a meeting of the Rubber Section of the Canadian Chemical Association held at the University of Toronto, Toronto, Canada, on March 4. Speaking on "Big Things from Small Beginnings in the Rubber Industry," Mr. Warner reviewed the growth of the plantation rubber industry and the rubber manufacturing industry. He referred to the smuggling of rubber seeds out of Brazil by Wickham, cornering of the rubber market by a British syndicate which stimulated planting, and the discovery of organic accelerators as a few of the "small beginnings" in the industry which led to "big things."

Monsanto Acquires Fiberloid

Monsanto Chemical Company, St. Louis, Mo., has acquired the assets of the Fiberloid Corporation, producers of plastic and molding compounds in Springfield, Mass. The acquisition was based on an exchange arrangement of capital stock, *i.e.*, seven shares of Monsanto stock for twelve shares of Fiberloid stock. The Fiberloid concern was established in 1892 and employs more than 1,000 people.

Obituaries

Harry W. Weida

Harry W. Weida, works manager of both the Akron, Ohio, and Butler, N. J., plants of the American Hard Rubber Company, died suddenly at the wheel of his automobile in New York City, on February 12. He was

57 years of age. Mr. Weida had been in poor health since last June but was believed to be recovering. He had returned from a trip to South America only a week before his sudden death. Born in Huntington, Penna., Mr. Weida went to Akron at the age of 12, and shortly after completing his education entered the rubber industry. For a number of years he was manager of the old Diamond Rubber Company. In 1913 he left Akron to join the hard rubber plant operated by the United States Rubber Company in New Brunswick, N. J., and after spending a few years with U. S. Rubber resigned to join American Hard Rubber as works manager. For the past few years he had made his home in Plainfield, N. J. Mr. Weida was a charter member of the old South End Athletic Club in Akron. He was also a member of the Akron City Club, a Shriner, and a 32nd degree Mason. Funeral services were held in Akron on February 16 with interment in Glendale Cemetery. He leaves a widow and daughter.

Frederick W. Dunbar

Frederick W. Dunbar, president of F. W. Dunbar and Company, rubber importers of 7 Water Street, New York City, died on February 23 at his home, 80 Park Street, Montclair, New Jersey, after an illness of two weeks. He was 74 years of age. Mr. Dunbar was born in East Boston, Mass., and was educated in the public schools of Boston. He worked for a time in the Maverick Bank in Boston and came to New York City in 1898 as a junior clerk for the Commercial Company. In 1913 he founded the company which bears his name and was active in its management until his death. Mr. Dunbar was a member of the Commodity Exchange, the Rubber Trade Association of New York, and was a director of the First National Bank and Trust Company of Montclair. His fraternal activities included membership in the Boston lodge of Masons and the East Orange lodge of Elks. Funeral services were held in Montclair with interment in Barnstable, Mass. He leaves a widow and daughter.

Clarence O. Gleghorn

Clarence O. Gleghorn, recently appointed manager of the Chicago manufacturers' sales department of the B. F. Goodrich Company, died in Harper Hospital, Detroit, on February 9, at the age of 51. Death was caused by pneumonia. Mr. Gleghorn was born near Akron in 1887 and joined Goodrich in 1907 as an office boy after his graduation from high school. He was placed in the sales department a few years later, represented the company in the middle west, was sent to Detroit in 1919 (after a two-year leave of absence during which he served with General Pershing in Mexico), and remained with the Detroit manufacturers' sales office until named as manager of the Chicago division two weeks before his death. Mr. Gleghorn was a member of the Detroit Athletic Club, American Legion, and the National Aeronautical Association. Funeral services and burial were in Detroit. He leaves a widow.

Harold G. Kitt

Harold G. Kitt, manager of advertising production for the Firestone Tire and Rubber Company, died suddenly on January 29 in City Hospital, Akron, following a minor operation. A native of England, Mr. Kitt has resided in Akron for the past 26 years, 25 of which he spent with Firestone. He was prominent in Masonic affairs and was a charter member of Tadmor Temple. Funeral services were held on February 2. He leaves a widow and daughter.

Set Toy Fair Dates

The 1938 American Toy Fair, sponsored by the Toy Manufacturers of U.S.A., Inc., 200 Fifth Avenue, New York City, will be held at the Hotel McAlpin, New York City, from April 25 to May 7.

Eulogize Harvey S. Firestone

A number of testaments eulogizing the late Harvey S. Firestone, Sr., chairman of the board and head of the vast Firestone interests, by close friends and associates in the rubber industry, have been publicized. Abstracts of some of these follow:

Henry Ford, head of the Ford Motor Co.—"In my opinion he was instrumental in bringing tire standards up to what they are today. Mr. Firestone would have been well known as a man even if he had never been an industrialist."

P. W. Litchfield, president of Goodyear—"Mr. Firestone was a truly imposing figure. My association with him has extended over many, many years. In business I knew him and respected him as the keenest of competitors, but our personal relationship was one of the utmost friendliness."

S. B. Robertson, president of Goodrich—"Goodrich learns with sincere regret of the sudden passing of H. S. Firestone and extends sympathy to his family and the institution he founded and directed so long and ably."

J. W. Thomas, president of Firestone—"To those of us who worked with him down through the years he was a warm, understanding friend—a man of high Christian ideals—a father whose interest in his family was paramount above all the demands of a full and busy life. The memory of his courage, vision and ideals will always remain an inspiration to us."

Funeral services were held on February 11 at Harbel Manor in Akron for Mr. Firestone, after his body had been carried through the Firestone factory after reaching Akron from Miami Beach. Richard Crooks, star of the Metropolitan Opera, sang several hymns while Rev. Walter F. Tunks, Mr. Firestone's pastor, read passages from the scriptures and offered prayers. Interment was in the village cemetery at Columbiana where the late industrialist was born.

On February 8, the Akron City Council voted unanimously to call a new viaduct, now under construction on South Main Street in Akron, the Harvey Samuel Firestone Memorial Bridge when completed. The span will link the South Akron area with the city proper and will cost approximately $1,400,000.

All five of Harvey Firestone's sons are now connected with the company he founded. The second Harvey Firestone, the oldest son, is vice-president and director of the parent concern and its many subsidiaries. It was he who founded the Firestone plantations in Liberia and has fostered their growth.

Russell, the second son, is manager of the mechanical goods division in Akron. Leonard is trade sales manager with offices in Akron. Raymond is president of the Firestone Tire and Rubber Company of Tennessee, which operates the Memphis plant. Roger, the youngest son, is at present district manager of sales in Houston, Texas. All five sons are graduates of Princeton, and each in turn reached his position with the company by gradual promotion.

Names in the News

CHARLES SLAUGHTER, Governor of the Commodity Exchange, Inc., delivered a lecture on "Rubber" on February 24 at a meeting held in the Great Hall of the New York Chamber of Commerce Building in New York City. The lecture was the second in a series of illustrated talks on commodities sponsored by the various commodity exchanges in the city.

E. G. HOLT, acting chief, Leather and Rubber Division, Department of Commerce, addressed a meeting of the Akron Export Club held at the Akron City Club on February 16. He said that world stocks of crude rubber were in better balance at the year-end than at any time since 1934.

R. C. FREITAG, formerly advertising manager of Amity Leather Products Company, has been named sales manager for the Chicago Rubber Clothing Co., Racine, Wisconsin.

ROBERT C. KELLEY, purchasing agent, Converse Rubber Co., Malden, Mass., writes on "Selecting the Source of Supply" in the February, 1938, issue of the *Executives Service Bulletin*, published by the Metropolitan Life Insurance Co.

EDGAR M. QUEENY, president, Monsanto Chemical Co., St. Louis, Mo., was recently elected a national vice-president of the National Association of Manufacturers.

ERNEST I. KILCUP, president, Davol Rubber Co., Providence, R. I., has been elected president and director of the Phenix National Bank of Providence.

N. S. WORRELL, sales division, American Zinc Sales Company, has been appointed central district manager for the company. He will maintain headquarters at Columbus, Ohio.

FRANK SIMONS, formerly chief chemist of Parker, Stearns & Co., and prior to that connected with C. Kenyon & Co., has joined the Brooklyn, N. Y., plant of the Admiar Rubber Co.

L. D. "LARRY" WALKER, associated with the Collyer Insulated Wire Co. for nine years, and more recently connected with the New England Cable Company, has been named chief chemist of the Triangle Conduit & Cable Co., Inc., Brooklyn, N. Y.

G. J. WYROUGH has been appointed chief chemist of the Goodall Rubber Co., Inc., Trenton, N. J. He was formerly with the Thermoid Rubber Co. and more recently with the Republic Rubber Co.

RALPH K. GUINZBURG, president, I. B. Kleinert Rubber Co., and HERMAN MUEHLSTEIN, president, H. Muehlstein & Co., have been named to represent the rubber industry on the committee sponsoring the program for the financing and coordination of New York City's health and welfare agencies under the auspices of the Greater New York Fund, Inc.

Form Laboratory Association

Representatives of more than twenty commercial laboratories met at Chicago recently and formed the American Council of Commercial Laboratories. One of the purposes of the new association will be the promotion of the proper use of scientific testing methods for the protection and certification of quality in advertised goods. Preston S. Miller of the Electrical Testing Laboratories, New York City, was named president of the group, while A. R. Ellis of the Pittsburgh Testing Laboratory, is treasurer.

TIRE SHIPMENTS CONTINUE DECLINE

Shipments of pneumatic casings during December, 1937, estimated at 3,153,402 units, show a decrease of 16.4% under shipments made in the previous month, and were 37.1% under December, 1936, shipments, while shipments made during January, 1938, estimated at 2,489,589 units, were 21.1% under December, 1937, and 44.8% under shipments made during January, 1937, according to statistics released by the Rubber Manufacturers Association.

Production of pneumatic casings during December, 1937, were estimated at 2,952,177 units, 5.1% under November and 44.4% under the same month of the previous year, and production during January, 1938, at 2,743,174 units, 7.1% under December and 44.9% under January, 1937.

Pneumatic casings in the hands of manufacturers on December 31, 1937, are estimated at 10,775,702 units, a decrease of 1.7% under stocks on hand on November 30 and 3% under those on hand on December 31, 1936. Pneumatic casings on hand on January 31, 1938, are estimated at 10,987,967, an increase of 2% above those on hand at the end of the previous month and 3.4% under stocks on hand on January 31, 1937.

TRENTON NEWS

The factory formerly operated by the Lambertville Rubber Company at Lambertville, N. J., recently purchased by Max Kalter of New York City, president of the Servus Rubber Company, Rock Island, Ill., is now in the process of being dismantled, all of the equipment being shipped to Rock Island. John T. Crowley, president, and Walter T. Scott, general sales manager, of the Lambertville concern, are both at the Servus plant in Illinois. Closing of the New Jersey factory resulted in more than 400 losing their jobs.

Employees of the Thermoid Company, Trenton, who are members of the United Rubber Workers of America, recently rejected a proposed wage cut by President Fred Schluter, calling for reduction of two to four cents an hour which would enable the firm to lower prices and thus be in a better position to compete with other rubber manufacturers on large orders, according to the Thermoid executive. As a result of the rejection, Mr. Schluter said the plant would probably be closed. At this writing the plant is still functioning. (See later news elsewhere in this issue.)

William H. King, vice-president and factory manager of the Pocono Rubber Company, Trenton, was named permanent trustee of that organization by Federal Judge Forman last month. Pocono recently filed for reorganization under Section 77b of the Bankruptcy Act.

The Overman Tire Company of Belleville, N. J., has been incorporated at Trenton with a capital of $300,000 preferred stock, $10,000 Class A common stock, and $90,000 Class B common stock. Incorporators were Alexander, Yetta and Phillip Kreger, all of Brooklyn, N. Y.

Approximately 500 employees of the Crescent Insulated Wire and Cable Company, Trenton, have banded to form a union. The management is believed to have consented to the organization.

MacEwan and Smith Corporation, formerly of Woodbridge, N. J., manufacturers of mechanical goods and other rubber products, are now located in the plant formerly occupied by the Rubber Products Corporation at Doylestown, Penna.

A. Boyd Cornell, secretary and general manager of the Hamilton Rubber Manufacturing Company, Trenton, was elected president of the Rubber Manufacturers Association of New Jersey at the annual meeting of that organization held recently at the City Club in Trenton. He succeeds the late John A. Lambert. Other officers elected were Lloyd Leaver (Hamilton), vice-president; Charles E. Stokes, Jr. (Home Rubber), secretary; and Horace B. Tobin, formerly with Woven Steel Hose and Rubber, treasurer.

MARKETS

RUBBER—COTTON AND FABRICS—CHEMICALS

NEW YORK, MARCH 9, 1938

Crude Rubber

SPORADIC factory interest in mid-February served to bring crude rubber prices into higher channels since our last report. The price on the Exchange rose steadily from 14.39 on February 9 to 15.09 on February 23. Almost complete cessation of factory purchasing after that date, however, resulted in a declining market, reaching 14.34, low for the period, yesterday (March 8). Proposed extension of the restriction scheme for five more years caused little flurry in the market since an extension had been anticipated by the trade. The price decline in the past two weeks, in addition to lack of factory purchases, was also influenced by other factors including notice of an increase in tire inventories, publication of the sharp increase in British stocks, and a none too favorable Malayan census report. Despite the current market, however, trade interests maintain that the long position in rubber will probably be in the direction of higher levels rather than lower. Quotations in the outside market, Exchange, London, and Singapore, follow:

As of March 9

Plantations—

Ribbed Smoked Sheets—			
No. 1 Spot	—	@	.14 5/8
February-March	—	@	.14 7/8
April-June	—	@	.14 7/8
No. 2	—	@	.13 1/2
No. 3	—	@	.13 3/8
No. 4	—	@	.13 1/4
Thin Latex Crepe	—	@	.15 5/8
Thick Latex Crepe	—	@	.15 5/8
Brown Crepe, No. 1	—	@	.13 7/8
Brown Crepe, No. 2	—	@	.13 5/8
Amber Crepe, No. 2	—	@	.13 7/16
Amber Crepe, No. 3	—	@	.13 3/8
Amber Crepe, No. 4	—	@	.12 1/8
Brown Crepe, Rolled	—	@	.11 7/16

Latex—

Normal, per lb., carload lots	—	@	.17½

Paras—

Up-River, fine	—	@	.12¾
Acre Bolivian, fine	—	@	.13

Balata—

Surinam sheet	—	@	.36

LONDON MARKET

Standard Smoked Sheets—Buyers—March 9			
April-June	—	@	7d
July-September	—	@	7 1/16d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—March 9			
April-June	—	@	6 13/16d
July-September	—	@	6 11/16d

Reclaimed Rubber

Although business in the past thirty days has remained quiet, reclaimers continue optimistic. Annual figures for consumption of reclaim in the United States during 1937 showed a slight increase over the previous year. Inventories at the end of the year, however, were higher. There have been no changes in the price structure since our last report. Current quotations follow:

Shoe

Unwashed	lb.	.07	@ .07¼
Washed	lb.	.10½	@ .10¾

Tube

No. 1 (Floating)	lb.	.14	@ .14½
No. 2 (Compounded)	lb.	.09	@ .09½
Red tube	lb.	.09	@ .09½

Tires

Black (acid process)	lb.	.07¼	@ .07½
Black, selected tires	lb.	.06¼	@ .06½
Dark Gray	lb.	09¾	@ .10
White	lb.	.13	@ .13½
Truck, Heavy Gravity	lb.	.06	@ .06½
Truck, Light Gravity	lb.	.07½	@ .08

Miscellaneous

Mechanical blends	lb.	.04½	@ .05

Scrap Rubber

(Delivered Akron Mills)

Dealers report a dull market with little action. Stocks are not moving freely, many of the smaller suppliers holding out for a better market. Optimism still prevails for a pick-up in the spring. Prices have dropped on all grades of scrap since our last report. Current quotations follow:

(Prices to Consumers)

Auto tire peelings	ton	17.00	@19.00
Mixed auto	ton	12.00	@13.00
Beadless tires	ton	15.50	@17.00
Clean solid truck tires	ton	23.50	@25.00
Boots and shoes	ton	15.00	@17.50
Arctics, untrimmed	ton	11.00	@14.00
Inner tubes, No. 1	lb.	.08	@ .09
Inner tubes, No. 2	lb.	.04	@ .04⅛
Inner tubes, Red	lb.	.03⅞	@ .04

Cotton

Cotton prices swung in a 49 point range since our last report, starting with a low of 8.88 on February 14, reaching a high for the period of 9.37 on February 23, and dropping to 9.16 today (March 9). More cotton is expected to be brought out from the interior in the next few weeks because of the ruling of the Commodity Credit Corporation yesterday on government loans. This ruling found that an immediate payment of 2 cents per pound to producers surrendering loan cotton to the C.C.C. could not be made under the provisions of the new farm law. Although the 2-cent payment was provided for in the law, Congress did not appropriate the necessary funds. Producers, therefore, will have to wait until such funds are available. The ruling definitely stated that the sum provided under the 1937 deficiency appropriation for a 3-cent per pound subsidy to growers cooperating in the 1938 cotton program could not be applied to the current 2-cent per pound program. Surprisingly, the decision caused little ripple in the futures market. Quotations for middling uplands on the Exchange follow:

	Feb. 8	March 9		
	Close	High	Low	Close
March	8.62	9.07	9.02	9.07
May	8.69	9.10	9.05	9.10
July	8.78	9.16	9.09	9.13

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3	lb.	.29½	@ .29¾
Peeler, carded, 23/4/3	lb.	.30½	@ .30¾
Peeler, carded, 15/3/3	lb.	.27½	@ .27¾
Peeler, carded, 13/3/3	lb.	.26½	@ .26¾
Egyptian, carded, 23/5/3	lb.	.43¼	@ .43½
Egyptian, combed, 23/5/3	lb.	.48¼	@ .48½
CHAFERS			
Carded, American, 1 3/16"	lb.	.29¼	@ .29¾
Carded, American, 1"	lb.	.21½	@ .25½

Sheetings

48x40	36	in.	5.50	lb.	— @ .04
40x40	36	in.	6.15	lb.	— @ .03⅝
40x36	36	in.	6.50	lb.	— @ .03⅜
48x48	40	in.	2.50	lb.	— @ .07½
48x48	40	in.	2.85	lb.	— @ .06½
56x60	40	in.	3.60	lb.	— @ .06⅛
48x44	40	in.	3.75	lb.	— @ .05⅜
44x40	40	in.	4.25	lb.	— @ .05

Ducks

Enameling (single filling)	lb.	.20	@ .23
Belting and Hose	lb.	.25	@ —
Single filling, A grade	lb.	.09¾	@ .12¾
Double filling	lb.	.11¼	@ .13

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 tons

FROM FEBRUARY 9 TO MARCH 9

Date	Spot	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Sales
Feb. 9	14.39	14.35	14.43	14.51	14.60	14.66	14.72	14.78	14.83	14.89	14.94	15.00	15.05	——	264
10	14.49	14.44	14.52	14.61	14.70	14.76	14.83	14.89	14.95	14.99	15.02	15.06	15.11	——	217
11	14.41	14.37	14.45	14.55	14.65	14.71	14.77	14.82	14.88	14.93	14.98	15.03	15.14	——	92
12	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
13	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
14	14.46	14.42	14.50	14.59	14.68	14.75	14.82	14.88	14.95	14.99	15.03	15.08	15.13	——	121
15	14.60	14.58	14.66	14.75	14.84	14.90	14.97	15.02	15.08	15.12	15.16	15.20	15.25	——	195
16	14.84	14.84	14.92	15.01	15.10	15.15	15.20	15.25	15.30	15.35	15.40	15.45	15.50	——	402
17	14.89	14.87	14.95	15.03	15.12	15.18	15.22	15.29	15.34	15.41	15.47	15.53	15.59	——	675
18	14.83	14.79	14.87	14.96	15.05	15.11	15.18	15.24	15.30	15.34	15.38	15.41	15.47	——	557
19	14.85	14.82	14.90	14.99	15.08	15.14	15.20	15.25	15.30	15.33	15.37	15.41	15.46	——	82
20	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
21	15.05	15.01	15.09	15.17	15.25	15.32	15.39	15.45	15.52	15.57	15.62	15.68	15.74	——	263
22	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
23	15.09	15.07	15.13	15.25	15.35	15.43	15.50	15.58	15.64	15.70	15.77	15.83	15.92	——	762
24	14.98	——	14.98	15.06	15.15	15.24	15.33	15.40	15.45	15.53	15.60	15.68	15.75	——	295
25	14.90	——	14.92	14.98	15.05	15.13	15.21	15.28	15.35	15.42	15.50	15.58	15.65	——	409
26	14.78	——	14.78	14.86	14.95	15.02	15.09	15.16	15.22	15.29	15.35	15.42	15.49	——	100
27	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
28	14.82	——	14.82	14.88	14.95	15.03	15.12	15.19	15.26	15.30	15.35	15.40	15.46	——	164
Mar. 1	14.94	——	14.95	15.00	15.05	15.12	15.19	15.24	15.30	15.37	15.43	15.50	15.56	15.62	155
2	14.80	——	14.82	14.88	14.94	15.01	15.09	15.14	15.19	15.25	15.31	15.37	15.43	15.49	103
3	14.72	——	14.75	14.80	14.85	14.91	14.97	15.04	15.10	15.16	15.22	15.28	15.34	15.40	105
4	14.58	——	14.60	14.64	14.68	14.75	14.83	14.88	14.93	14.99	15.06	15.13	15.19	15.25	219
5	14.40	——	14.45	14.52	14.60	14.65	14.70	14.75	14.81	14.87	14.93	15.00	15.06	15.12	55
6	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
7	14.45	——	14.47	14.51	14.55	14.60	14.66	14.74	14.82	14.87	14.93	14.99	15.05	15.11	92
8	14.34	——	14.38	14.43	14.48	14.53	14.59	14.64	14.68	14.75	14.80	14.85	14.91	14.97	220
9	14.34	——	14.37	14.43	14.50	14.56	14.62	14.68	14.74	14.80	14.86	14.92	14.98	15.04	154

Rubber CHEMICAL Markets

NEW YORK, MARCH 9, 1938 [All Quotations F.O.B. Works Unless Otherwise Noted]

ACCELERATORS

Organic				
A-1 (Thiocarbanilid)	lb.	.26	@	—
A-5-10	lb.	.35	@	.40
A-11	lb.	.52	@	.65
A-19	lb.	.52	@	.65
A-32	lb.	.70	@	.80
A-77	lb.	.42	@	.55
A-100	lb.	.42	@	.55
A-433	lb.	.45	@	.55
Aldehyde ammonia, crystals	lb	.65	@	.70
Altax	lb	—	@	—
Captax	lb.			
Crylene	lb.	.55	@	.65
paste	lb.	.45	@	.55
Di-Ortho-Tolyguanidine	lb.	.44	@	.46
Diphenylguanidine	lb.	.35	@	.36
El-Sixty	lb.	.57	@	—
Ethylidene aniline	lb.	.45	@	.47½
Formaldehyde aniline	lb.	.37½	@	.42
Guantal	lb.	.45	@	—
Heptene	lb.	.40	@	—
Hexamethylenetetramine	lb.	.36	@	—
Lead Oleate, No. 999	lb.	.14	@	—
Witco		.15	@	—
Lithex	lb.	.18	@	.20
Methylenedianiline	lb.	.36	@	.37
Monex	lb.	3.25	@	—
Oxynone	lb.	.64	@	.80
Phenex	lb.	.50	@	.55
Pip-Pip	lb.	2.50	@	—
Pipsolene	lb.	1.55	@	1.85
R & H 40	lb.	.40	@	.41
R & H 50	lb.	.40	@	.41
R-2	lb.	1.40	@	1.80
R-23	lb.	.40	@	—
Safex	lb.	1.20	@	1.25
SPDX	lb.	.75	@	—
Super-Sulphur No. 1	lb.			
No. 2	lb.			
Thiocarbanilid, drums	lb.	.24	@	.30
Trimene	lb.	.75	@	—
base	lb.	1.20	@	—
Triphenylguanidine	lb.	.58	@	.60
Tuads	lb.			
Ureka	lb.	.60	@	.75
Ureka Blend B	lb.	.60	@	.75
Ureka C	lb.	.56	@	.65
Vulcanex	lb.			
Vulcone	lb.			
Vulcanol	lb.			
Z-88-P	lb.	.51	@	—
Zimate	lb.			
Inorganic				
Litharge, domestic	lb.	.06½	@	.07¾
Magnesia, calcined, heavy	lb.	.04	@	—

COLORS

Blacks (See Compounding Materials)				
Blues				
Prussian	lb.	.36	@	.37
Ultramarine	lb.	.15	@	—
Browns				
Mapico	lb.	.13	@	—
Umber, Turkey	lb	.04	@	.04½
Greens				
Chrome	lb.	.21	@	—
Chromium Oxide, bbl.	lb.	.21	@	—
Guignet's Green	lb.	.70	@	—
Reds				
Antimony				
crimson, 15/17	lb.	.48	@	—
sulfur, free	lb.	.48	@	.60
Indian English	lb.	.09	@	.10
Domestic (Maroon)	lb.	.11	@	—
Red oxide, pure	lb.	.10	@	.12
Rub-Er-Red, f.o.b. Easton	lb.	.09¼	@	—
Whites				
Cryptone, No. 19	lb.	.05⅞	@	.06⅛
Cryptone CB, No. 21	lb.	.05⅞	@	.06⅛
Cryptone, ZS-20	lb.	.09	@	.09½
Cryptone, ZS-86	lb.	.09	@	.09½
Lithopone				
Albalith, black label—11	lb.	.04¾	@	.04¾
Azolith	lb.	.04⅜	@	.04⅜
Rayox	lb.			
Titanox A	lb.	.16	@	.16¾
Titanox B	lb.	.05⅞	@	.06⅛
Titanox C	lb.	.05⅞	@	.06⅛
Zinc Oxide—American Process				
American Azo:				
ZZZ (lead free)	lb.	.06¼	@	.06½
Anaconda, lead free	lb.	.06¼	@	.06½
Horsehead Lead Free Brand:				
Special—3	lb.	.06¼	@	.06½
XX Red—4	lb.	.06¼	@	.06½
XX Red—72	lb.	.06¼	@	.06½
XX Red—78	lb.	.06¼	@	.06½
XX Red—103	lb.	.06½	@	.06¾
Kadox, black label—15	lb.	.06½	@	.06¾
Blue label—16	lb.	.06½	@	.06¾
Red label—17	lb.	.06½	@	.06¾
St. Joe, black label	lb.	.06	@	.06¼
green label	lb.	.06	@	.06¼
red label	lb.	.06	@	.06¼
U. S. P.—7, bbls.	lb.	.09	@	.09¼
Zinc Oxide—French Process				
Florence White seal—7 bbls.	lb.	.08½	@	.08¾
Green seal—8	lb.	.08	@	.08¼
Red seal—9	lb.	.07½	@	.07¾
Yellows				
Cadmolith	lb.	.61	@	—
Chrome	lb.	.14½	@	.15½
Mapico	lb.	.09½	@	—

BLACKS

Arrow "Aerfloted" Specification	lb.	.027	@	.036
Bone, powdered	lb.	.05½	@	.06
Carbon, compressed	lb.	.0435	@	.0775
uncompressed	lb.	.0435	@	.0775
"Certified"	lb.	—	@	—
Spherons	lb.	—	@	—
"Disperso"	lb.	.027	@	.036
Drop, bbls.	lb.	.05½	@	.14
"Excello," compressed	lb.	.0435	@	.0775
"Fumonex"	lb.	.03	@	.07
"Gastex"	lb.	.03	@	.07
Lampblack	lb.	.07	@	.12
"Micronex"	lb.	.027	@	.036
"Supreme"	lb.	.0435	@	.0775
Thermatomic—"P 33"	lb.	—	@	—
"Thermax"	lb.	—	@	—
United "Dixie" & "Kosmos"	lb.	.027	@	.036

COMPOUNDING MATERIALS

Aluminum Flake	ton.	21.85	@	24.50
Ammonia carbonate, lump	lb.	.10½	@	.12
Asbestine	ton	13.00	@	15.00
Barium carbonate (98-100%)	ton	52.50	@	57.50
Barium Dust	lb.	.05	@	.06
Barytes	ton	23.65	@	31.15
Basofor	lb.	.04½	@	—
Bentonite	lb.	.02	@	.03
Blanc fixe dry f.o.b. works	ton	60.00	@	65.00
Calcene	ton	37.50	@	45.00
Catalpo (fact.)	lb.	.02	@	—
Chalk, precipitated				
Suprex white, extra lt.	ton	45.40	@	60.00
heavy	ton	45.00	@	55.00
Clay, Kaolin, domestic	ton	7.50	@	15.00
Aerfloted, Suprex	ton	9.50	@	21.00
Congaree	ton	9.50	@	—
Crown (f.o.b. plant)	ton	9.50	@	—
Dixie	ton			
Dixie, Jr.	ton			
McNamee	ton			
Par	ton			
Tensulite	ton	15.00	@	—
Witco	ton	9.50	@	—
Cotton Flock	lb.	.11	@	.15
Glues, extra white	lb.	.28	@	.30
medium white	lb.	.14	@	19
Kalite No. 1	ton	—	@	—
Kalite No. 3	ton	—	@	—
"Lime Crest" Industrial Filler No. 100	lb.	—	@	—
Magnesium carbonate	lb.	.07½	@	—
Mica	ton	35.00	@	44.00
Pyrax A	ton	—	@	—
Rottenstone (powdered)	lb.	.02½	@	.05
Soapstone, powdered	ton	16.00	@	22.00
Starch, powdered	cwt.	2.90	@	4.10
Talc, domestic	ton	17.00	@	20.00
Whiting, commercial	ton	17.00	@	18.00
Columbia Filler	ton	9.00	@	14.00
English Cliffstone	ton	33.00	@	43.00
Witco	ton	7.00	@	—
Wood Flour	ton	20.00	@	25.00
Zinc Carbonate	lb.	—	@	.10¾
Zinc Stearate	lb.	—	@	.27

MINERAL RUBBER

Black Diamond	ton	27.00	@	—
Genasco, solid (factory)	ton	25.00	@	27.00
Hard Hydrocarbon	ton			
Parmr, solid	ton	25.00	@	—
Pioneer, MR, solid	ton			
Pioneer-granulated	ton			

MISCELLANEOUS

Aromatics—Rodo	lb.			
Curodex 19	lb.	2.75	@	—
Curodex 188	lb.	3.50	@	—
Curodex 198	lb.	4.50	@	—
Para-Dors No. 5145	lb.	2.00	@	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.40	@	—
Santomerse (dispensing, wetting, penetrating and stabilizing agent)	lb.	.13	@	—
Sunproof	lb.	.35	@	.37½
Sponge Paste	lb.	—	@	.80
Tackol (tackifier)	lb.	.115	@	—
Tonox	lb.	.56	@	.60

SOFTENERS

Acids				
Acetic, 28%, bbls.	100 lb.	2.53	@	2.78
Nitric, 36 degrees	cwt.	5.00	@	6.00
Sulfuric, 66 degrees	ton	15.50	@	16.50
Acids, Fatty				
Laurex	lb.	.15	@	.16
Stearex Beads	lb.	.10¾	@	.11¾
Stearic, double pressed	lb.	.12½	@	.13½
Stearite	lb.	.10½	@	.11¾
Alkalies				
Caustic Soda, 76%	cwt.	3.15	@	3.80
Soda Ash, 58%, C.L.	cwt.	—	@	2.35
Oils				
Cycline Oil	gal.	.20	@	—
Degras, bbls.	lb.	.07¾	@	.08
Fluxrite	lb.	.05½	@	.06½
Palm Niger	lb.	.05½	@	.06½
Para-Flux	gal.	.17	@	—
Petrolatum, light	lb.	.03⅛	@	.03⅜
Pigmentaroil, tank cars	gal	.16	@	—
in drums	gal.	.22½	@	.23½
Pine, steam distilled	gal.	.64	@	.69
dest. dist., drums	gal.	.49	@	.50
Rosin Oil, cmpd	gal.	.40	@	—
Rubberol, f.o.b. Chicago	lb.	.13½	@	.14
Rubtack	lb.	.08	@	.10
Seedine, c.l.	lb.	.07¼	@	—
Tackol	lb.	.08½	@	.18
Witco Palm Oil	lb.	.07	@	—
Witco Softener No. 20	gal.	.20	@	—
Woburn No. 8, c.l.	lb.	.06	@	—
Wobonite, c.l.	lb.	.05	@	—
Resins and Pitches				
Pitch, Burgundy	lb.	.05½	@	.06½
coal tar	ton	19.00	@	22.00
hardwood	ton	16.00	@	22.50
pine, 200 lb. gr. wt.	bbl.	6.00	@	6.50
Pigmentar, tank cars	gal.	.16	@	—
in drums	gal.	.22½	@	.23½
R. S. L. Resin	lb.	—	@	—
Retort Pine Tar, drums	ton	20.00	@	26.00
Solvents				
Acetone, pure	lb.	—	@	.06¼
Alcohol, denatured, methanol, No. 1 bbls.	gal.	.33	@	.39
Benzene, 90%	gal.	.18	@	.21
Beta-Trichlorethane	gal.	—	@	.20
Bondogen	lb.	—	@	
Carbon, bisulfide	lb.	.05¼	@	.08
Carbon tetrachloride	lb.	.05¾	@	.08¼
Dichlorethylene	lb.	—	@	.25
Dipentene, cml., drums	gal.	.41	@	.50
Dryolene (f.o.b. Okla.)	gal.	.10	@	.10½
Ethylene dichloride	lb.	.05½	@	.06½
Plastogen	lb.			
Reogen	lb.			
Rub-Sol (f.o.b. Okla.)	gal.	.09	@	
Trichlorethylene	lb.	—	@	.09½
Turpentine, spirits	gal.	.43	@	.47
dest. dist., drums	gal.	.33	@	.41
Waxes				
Beeswax, white	lb.	.39	@	.45
Carnauba, yellow	lb.	.46	@	.47½
Ceresin, white, dom.	lb.	.08	@	.11
Montan, crude	lb.	.10¾	@	.11¾
Paraffin (c.l.—f.o.b. N. Y.)				
Yellow crude scale	lb.	.02¾	@	—
White crude scale 124/126	lb.	.02¾	@	.03
Refined, 122/127	lb.	.04½	@	—

ANTI-OXIDANTS

AgeRite, Gel	lb.			
HP	lb.			
Powder	lb.			
Resin	lb.			
White	lb.			
Albasan	lb.	.70	@	.75
Antox	lb.			
B-L-E	lb.	.57	@	.60
Flectol H	lb.	.54	@	—
Flectol White	lb.	1.00	@	—
Flectol B	lb.	.54	@	—
Neozone	lb.			
Oxynone	lb.	.68	@	—
Perflectol	lb.	.67	@	.75
Retardex	lb.	.35	@	.40
Santoflex A	lb.	—	@	—
Santoflex B	lb.	.54	@	—
Stabilite	lb.	.57	@	.62
Stabilite Alba	lb.	.70	@	.75
VGB	lb.	.55	@	.60

MOLD LUBRICANTS

Aresklene	lb.	—	@	—
Cocoa Soapstock	lb.	.06	@	.08
Dipex	lb.	.06	@	.08
Lubrex	lb.	.25	@	.30
Mold Paste	lb.	.18	@	—
Rubberol, f.o.b. Chicago	lb.	.13½	@	.14
Rusco, f.o.b. Nitro	lb.	—	@	.30
Sericite, f.o.b. N. Y.	ton	65.00	@	—
Soap Tree Bark, cut, sifted	lb.	.06	@	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.19	@	—
Black	lb.	.07	@	.13½
White	lb.	.085	@	.15¼
Brown	lb.	.085	@	.14
Neophax	lb.	.11	@	—

VULCANIZING INGREDIENTS

Sulfur Chloride, yellow (drs.)	lb.	.04½	@	—
Sulfur flour.				
Refined, 100% pure (bags)	cwt.	2.55	@	3.65
Commercial (bags)	cwt.	1.60	@	2.35
Telloy	lb.			
Vandex	lb.			

Crude Rubber
Latex and Guayule
Reclaimed Rubber
Tires and Tubes

STATISTICS OF THE INDUSTRY

Rim Production
Automobiles
Gasoline
Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1922	301,076	101,843,188	15.10	4,809	1,921,828	17.84	296,267
1923	309,362	185,060,304	26.71	8,772	5,672,319	28.87	300,590
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1936:							
Sept.*	48,368	16,691,919	15.41	656	244,554	16.64	47,712
Oct.	39,573	13,627,465	15.37	778	268,645	15.42	38,795
Nov.*	36,798	12,790,306	15.52	675	241,982	15.99	36,123
Dec.	49,312	17,555,705	15.89	677	267,745	17.65	48,635
1937:							
Jan.	42,002	15,408,242	16.38	844	372,053	19.69	41,158
Feb.	42,743	16,470,867	17.20	523	236,853	20.21	42,220
Mar.	38,682	16,030,267	18.50	1,146	522,931	20.37	37,536
Apr.	41,427*	17,859,223	19.31	1,050	415,484	17.66	40,377*
May	46,902	22,163,440	21.10	528	270,499	21.08	46,374
June	47,073	22,559,545	21.39	807	390,542	21.60	46,266
July	41,493	19,010,273	20.45	767	300,301	17.48	40,726
Aug.	48,020	20,595,314	19.15	670	265,298	17.69	47,350
Sept.	55,123	22,119,248	17.91	668	280,741	18.76	54,455
Oct.	51,171	20,250,893	17.67	450	172,466	17.13	50,721
Nov.	51,958	19,905,523	17.01	159	66,501	18.72	51,799
Dec.	68,006	24,934,206	16.37	290	91,764	14.14	67,716
1938:							
Jan.	43,984	15,115,732	15.34	325	118,514	16.27	43,659

* Revised.

Note: Annual figures for 1922-1936 revised on basis of information received on February 8, 1937. Figures for 1922 and 1923 include latex; guayule is included only in 1922.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule: Tons	Guayule: Dollars	Balata: Tons	Balata: Dollars	Jelutong: Tons	Jelutong: Dollars	Liquid Latex (1): Tons	Liquid Latex (1): Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	....	.....	1,659	2,261,869	5,990	944,893	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1937:								
Jan.	160	44,166	10	4,348	247	56,056	1,337	535,546
Feb.	206	56,807	14	5,838	242	61,741	1,973	775,202
Mar.	136	37,453	29	13,949	898	187,413	2,216	968,053
Apr.	190	52,361	3	1,457	617	135,412	1,633	724,757
May	182	50,093	75	33,881	642	145,618	1,995	941,235
June	147	39,941	91	41,481	488	135,468	2,561	1,253,370
July	371	106,360	22	9,363	533	158,998	1,921	924,127
Aug.	335	95,893	16	5,876	363	107,611	1,801	838,778
Sept.	329	90,822	5	2,196	701	214,511	1,901	839,159
Oct.	247	68,178	29	12,090	460	149,516	1,958	844,205
Nov.	251	69,452	29	9,374	593	194,889	2,085	875,074
Dec.	140	34,347	31	11,491	1,325	470,553	1,804	694,164
1938:								
Jan.	538	147,685	23	8,958	598	224,443	1,400	494,242

(1) Weight given in pounds of dry rubber contained in latex.

Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)
(All Quantities in Long Tons)

	1931	1932	1933	1934*	1935*	1936*	1937	1938
Figures on Monthly Basis								
Jan.	28,557	29,648	22,645*	39,190	46,636	48,631	50,818*	29,429
Feb.	28,797	31,821	21,392*	40,515	42,720	36,841	51,887*	
Mar.	32,788	29,505	17,483*	47,003	42,153	42,813	54,064	
Apr.	33,321	27,518	25,928	44,853	44,247	52,031	51,797	
May	37,817	30,957	44,074	42,918	41,101	50,612	51,733	
June	37,916	41,475	50,743*	40,147	36,156	52,772	51,798	
July	31,397	29,976	49,614*	32,553	35,917	48,250	43,650	
Aug.	27,586	23,721	44,428*	33,216	38,775	46,777	41,456	
Sept.	23,638	23,847	35,281*	30,258	37,086	46,449	43,893	
Oct.	22,277	22,286	31,543*	31,253	41,969	49,637	38,707	
Nov.	22,943	23,231	28,831*	34,748	42,310	50,433	33,984	
Dec.	21,409	18,015	28,757*	36,569	42,474	49,754	29,160	
Tt.	348,986	332,000	400,719*	453,223	491,544	575,000	542,947	

* Revised.

Note: Figures for 1936 were revised on May 15, 1937, and are now based on Department of Commerce survey figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks[a]	Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks[a]
1928	208,516	223,000	50.4	24,785	1933	99,560	81,602	19.9	20,746
1929	218,954	226,588	48.4	27,464	1934	110,010	100,597	22.2	23,079
1930	157,967	153,497	40.8	22,000	1935	122,948	113,078*	23.0*	25,069
1931	133,351	124,126	33.9	19,257	1936	150,571	141,486*	24.6*	19,000*
1932	75,608	77,504	23.4	16,354	1937	178,776	157,990	29.1	26,260
Figures on Monthly Basis									
1937:									
Jan.*	15,129	14,450	28.4	18,822	July	16,241*	12,128*	27.8*	17,682*
Feb.*	15,192	14,578	28.1	18,490	Aug.	16,543*	13,227*	31.9*	19,706*
Mar.*	14,462	15,601	28.9	16,450	Sept.	16,410	13,681	37.4	21,597
Apr.	13,884	15,607	30.1	14,046	Oct.	15,849	12,234	31.6	23,572
May	15,793	14,693	28.4	14,647	Nov.	12,406	9,703	28.6	24,620
June	16,052	14,414	27.8	14,535	Dec.	10,815	7,674	26.3	26,260
1938:									
Feb.	.....	.....	...	.....	July	.....	.....	...	.....
Mar.	.....	.....	...	.....	Aug.	.....	.....	...	.....
Apr.	.....	.....	...	.....	Sept.	.....	.....	...	.....
May	.....	.....	...	.....	Oct.	.....	.....	...	.....
June	.....	.....	...	.....	Nov.	.....	.....	...	.....
Jan.	8,467	6,673	22.7	27,179	Dec.	.....	.....	...	.....

[a] Stocks on hand at the end of month or year.

* Revised.

Note: Figures for 1936 were revised on June 1, 1937, and are now based on Department of Commerce survey figures.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1935*	1936*	1937		1935*	1936*	1937
January	28,147	32,344	33,696	August	43,097	46,061	49,597
February	26,580	27,178	32,000	September	37,976	44,366	47,245
March	32,272	35,864	40,561	October	41,566	44,163	45,361
April	36,363	38,864	43,409	November	35,991	39,954	42,666
May	39,381	42,010	45,484	December	33,872	39,590	39,457
June	38,086	44,522	48,580				
July	41,479	46,865	50,704*	Total	434,810	481,606	518,760

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1926	24,199,524	1930	17,364,096	1934	12,255,118
1927	19,700,003	1931	11,253,800	1935	18,664,356
1928	24,247,282	1932	6,261,336	1936	20,790,192
1929	24,141,502	1933	8,713,962	1937	22,257,964

1938		1938		1938	
January	527,899	May	.....	September	.....
February	.....	June	.....	October	.....
March	.....	July	.....	November	.....
April	.....	August	.....	December	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market. in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1935																																
December	—	13⅞	13¾	12⅞	13	13⅞	13¾	—	13	12⅜	13	13	13	13⅛	—	13⅞	13⅞	13⅞	13¾	13¾	13¼	—	13¼	13¼	—	13⅞	13⅜	—	13½	13⅞	13¼
1936																																
January	—	13½	13⅜	13⅜	—	13⅜	13⅛	—	—	—	—	—	14⅛	14⅛	14⅛	14⅞	14⅞	14⅛	—	14⅜	14½	—	14⅛	15	15	—	15⅞	14⅛	14⅛	14⅛	14⅛	14⅜
February	—	15⅞	15⅞	15⅞	15⅝	15⅞	15⅞	15⅞	—	—	—	15⅛	15⅞	15¾	15¾	15⅞	15⅞	15⅞	15⅞	16	15¾	—	16	16	15½	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞
March	—	15⅝	15⅝	15¾	—	15⅝	15⅝	—	16	—	—	15⅛	16	15⅝	16	16⅛	16⅛	16⅛	15⅝	16	15⅛	—	16	16	16	16	16	15⅝	15⅝	15⅝	15⅞	15⅞
April	—	15⅛	15⅛	15⅛	15⅜	15⅛	15⅛	16	15⅜	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅝	15⅝	15⅝	15⅝	—	15⅝
May	—	15⅛	15⅛	15⅛	15⅜	15⅛	15⅛	16	15⅜	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅝	15⅛	15⅛	15⅛	15⅛	15⅛	15⅜	15⅝	15⅝	15⅝	15⅝	15⅝	—	15⅝
June	—	15⅜	15⅜	15⅜	15⅜	15⅛	15⅛	15⅝	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅝	15⅝	15⅝	15⅝	15⅝	—	15⅝
July	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Aug.	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Sept.	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Oct.	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Nov.	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Dec.	—	18⅛	18⅛	18⅜	18⅜	18⅜	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
1937																																
Jan.	—	—	—	20⅛	20¾	21⅛	21⅛	21⅛	22⅛	21½	22⅛	22⅛	22	21⅛	21⅛	21⅞	—	21⅞	20⅛	21⅛	20⅝	20⅝	20⅝	—	—	—	21⅛	21⅛	21⅛	21⅛	—	21⅜
Feb.	—	21	—	21¼	21¾	21½	21⅛	21½	23⅛	23⅜	23⅛	23⅛	23⅜	23⅛	23⅛	24⅞	24⅞	25⅛	24⅛	24⅛	24¼	24¼	23⅞	23⅞	25⅛	25⅛	21⅞	21⅞	26½	26½	26½	24 7/16
Mar.	—	21⅞	21⅜	21⅜	22⅛	22⅛	24⅛	25⅝	24⅝	24⅝	24⅝	24⅝	23⅜	23⅜	23⅜	22⅞	22⅞	22⅞	22⅞	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛	23½
April	—	26⅜	26⅜	26⅜	25⅝	24⅜	24⅜	24⅜	24⅜	24⅜	24⅜	24⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜
May	—	21	21	21⅛	21½	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛	21⅛
June	—	20⅛	19⅛	19⅛	—	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
July	—	19⅜	18⅞	18½	18½	18½	18½	19⅛	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½
Aug.	—	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
Sept.	—	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
Oct.	—	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
Nov.	—	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
Dec.	—	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
1938																																
Jan.	—	—	—	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14½	—	—	14⅜
Feb.	—	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛	14⅛
Mar.	—	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Market)

Average Price per Pound for Years 1911-1930

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1911	141.30	1915	65.85	1919	48.70	1923	29.45	1927	37.72
1912	121.60	1916	72.50	1920	36.30	1924	26.20	1928	22.48
1913	82.04	1917	72.23	1921	16.36	1925	72.46	1929	20.55
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98

Average Monthly Price per Pound Since 1930

	1931 Cents	1932 Cents	1933 Cents	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents
Jan.	8.34	4.38	3.08	9.32	13.10	14.35	21.37	14.63
Feb.	7.70	4.03	2.95	10.45	12.92	15.48	21.33	14.71
Mar.	7.71	3.35	3.01	11.01	11.51	15.89	24.09	
Apr.	6.43	3.02	3.56	12.10	11.55	15.98	23.44	
May	6.49	3.09	4.95	13.26	12.05	15.62	21.14	
June	6.35	2.66	6.15	13.51	12.57	15.85	19.29	
July	6.37	2.89	8.01	14.60	12.10	16.49	18.86	
Aug.	5.38	3.63	7.31	15.47	11.98	16.25	18.37	
Sept.	5.08	3.84	7.30	15.36	11.55	16.46	18.55	
Oct.	4.87	3.65	7.64	13.96	12.62	16.55	16.28	
Nov.	4.65	3.44	8.66	13.04	13.15	17.97	14.60	
Dec.	4.64	3.24	8.87	12.98	13.28	20.01	15.41	
Average for Year	6.17	3.49	5.96	12.92	12.37	16.41	19.39	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1937 Dec.	1938 Jan.	1938 Feb.	1938 Mar.	Day	1937 Dec.	1938 Jan.	1938 Feb.	1938 Mar.
1	7 1/16	—	7	7 3/8	17	7 1/4	7 1/16	7	
2	7 1/16	—	7	7 3/8	18	7 1/16	7 1/16	7 1/16	
3	7 1/16	6 13/16	6 7/8	7 5/16	19	—	7 1/16	7 1/16	
4	7 1/16	6 13/16	6 7/8	7 5/16	20	7 1/4	7 1/16	—	
5	—	6 7/8	6 7/8	7	21	7 1/16	7 1/16	7 1/8	
6	7 1/16	6 7/8	—	—	22	7 1/16	7 1/4	7 1/16	
7	7 1/16	6 13/16	6 13/16	7	23	7 1/8	—	7 1/16	
8	7 1/16	6 7/8	6 7/8	6 13/16	24	7 1/4	7 1/16	7 1/16	
9	7 1/16	—	6 13/16	6 13/16	25	—	7 1/8	7 1/16	
10	7 1/16	7 1/8	7		26	—	7 1/8	7 1/16	
11	7 1/8	7	6 13/16		27	—	7 1/16	—	
12	—	7 1/8	6 13/16		28	7 1/8	7 1/8	7 1/8	
13	7 1/4	7 1/8	—		29	6 7/8	7	—	
14	7 1/16	7 1/16	6 13/16		30	7	—	—	
15	7 1/16	7 1/16	6 13/16		31	6 7/8	7 1/8	—	
16	7 1/4	—	7						

Average Monthly Price Per Pound

Month	1935 Pence	1936 Pence	1937 Pence	1938 Pence	Month	1935 Pence	1936 Pence	1937 Pence	1938 Pence
Jan.	6.434	6.758	10.378	7.077	Aug.	5.696	7.581	8.830	
Feb.	6.292	7.255	10.503	7.029	Sept.	5.508	7.577	8.935	
Mar.	5.745	7.450	11.766		Oct.	6.130	7.898	7.855	
Apr.	5.604	7.502	11.471		Nov.	6.308	8.572	7.080	
May	5.822	7.335	10.250		Dec.	6.340	9.580	7.332	
June	6.027	7.352	9.548		Average for Year	5.976	7.713	9.424	
July	5.801	7.696	9.136						

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1938 Jan.	1938 Feb.	1938 Mar.	Date	1938 Jan.	1938 Feb.	1938 Mar.	Date	1938 Jan.	1938 Feb.	1938 Mar.
1	—	8.51	9.16	11	8.72	8.81		22	8.53	—	
2	—	8.52	9.24	12	8.68	—		23	—	9.37	
3	8.38	8.55	9.27	13	8.68	—		24	8.60	9.31	
4	8.46	8.60	9.12	14	8.60	8.88		25	8.58	9.22	
5	8.48	8.64	9.20	15	8.63	8.93		26	8.54	9.22	
6	8.58	—	—	16	—	8.89		27	8.50	—	
7	8.58	8.61	9.16	17	8.60	9.06		28	8.44	9.27	
8	8.59	8.74	9.12	18	8.53	9.00		29	8.43	—	
9	—	8.87	9.16	19	8.59	9.10		30	—	—	
10	8.69	8.79		20	8.62	—		31	8.52	—	
				21	8.58	9.23					

Average Monthly Price Per Pound

	1935 Cents	1936 Cents	1937 Cents	1938 Cents		1935 Cents	1936 Cents	1937 Cents	1938 Cents
Jan.	12.70	11.91	13.06	8.57	Aug.	11.48	12.28	10.41	
Feb.	12.58	11.53	13.15	8.91	Sept.	10.80	12.31	9.02	
Mar.	11.63	11.43	14.46		Oct.	11.28	12.30	8.42	
Apr.	11.73	11.71	14.23		Nov.	12.01	12.23	7.96	
May	12.25	11.68	13.34		Dec.	11.99	12.83	8.26	
June	11.89	12.02	12.70		Average for Year	11.88	12.11	11.44	
July	12.26	13.11	12.26						

World Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1936*	ON HAND 1937	ON HAND 1938	AFLOAT 1936	AFLOAT 1937	AFLOAT 1938	ON HAND AND AFLOAT 1936*	ON HAND AND AFLOAT 1937	ON HAND AND AFLOAT 1938
Jan.	285,054	204,201*	269,078	43,870	55,096	57,356	328,924	259,297*	326,434
Feb.	282,902	193,864		46,532	53,538		329,434	247,402	
Mar.	276,823	191,928*		58,935	56,994		335,758	248,922*	
Apr.	277,478	174,934		47,678	72,530		325,156	247,464	
May	262,415	172,985		48,860	58,542		311,275	231,527	
June	245,544	169,646		47,228	57,215		292,782	226,861	
July	235,850	164,445		60,343	75,779		296,193	240,224	
Aug.	230,167	171,052		63,597	80,439		293,764	251,491	
Sept.	233,336	182,556		62,240	83,288		295,576	265,844	
Oct.	224,000	195,685		67,825	80,653		291,825	276,338	
Nov.	211,480	217,586		73,691	81,302		285,171	298,888	
Dec.	223,000	256,618		56,567	63,099		279,567	319,717	

(Rubber Manufacturers' Association figures raised to 100%)

* Revised.

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1936	London 1937	London 1938	Liverpool 1936	Liverpool 1937	Liverpool 1938
January	84,791	29,005	40,203	77,188	41,895	21,711
February	79,757	26,508		77,138	37,078	
March	74,779	21,292		72,823	30,622	
April	68,932	21,128		71,388	27,443	
May	61,349	21,351		69,150	25,081	
June	55,993	21,964		66,173	21,258	
July	49,575	22,589		63,715	19,424	
August	45,749	25,211		62,367	19,817	
September	44,364	28,462		59,485	21,190	
October	40,777	30,465		55,738	21,327	
November	37,495	32,304		51,184	21,399	
December	33,027	35,633		45,291	21,978	

(Figures from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

At end of 1937	Penang and Singapore [1]	Malaya [2]	Ceylon [3]	Holland	Para and Manaos
January	36,365	41,911	5,024	290	4,005
February	42,132	44,346	5,855	197	3,763
March	42,485	40,317	3,477	108	4,078
April	38,812	38,443	3,745	101	3,840
May	34,234	40,253	3,781	94	3,559*
June	45,085	48,545	4,558	98	1,019
July	44,759	43,270	3,725	124	1,050
August	47,873*	44,775	4,454	144	1,133
September	49,438*	38,131	5,294	135	1,543
October	41,948*	43,900	4,743	117	1,780
November	38,778	45,854	5,378	105	2,901
December	44,814	45,734	5,632	100	3,000

[1] Dealers' and Port Stocks. [2] Inside Regulated Areas. [3] Dealers' Stocks Only.
* Revised.

RUBBER STOCKS AFLOAT

End of: 1936:	Afloat for United States	Afloat for Europe	All Other * Afloat	Total * Afloat
December	56,567	24,800	21,633	103,000
End of: 1937				
January	55,096	24,920	17,984	98,000
February	53,538	27,250	13,212	94,000
March	56,994	31,240	36,766	125,000
April	72,530	34,410	17,060	124,000
May	58,542	31,500	26,958	117,000
June	57,215	34,700	33,085	125,000
July	75,779	45,100	23,121	144,000
August	80,439	40,300	19,261	140,000
September	83,288	37,400	20,312	141,000
October	80,653	35,000	19,347	135,000
November	81,302	39,100	6,598	127,000
December	63,099	44,000	27,901	135,000

* *Total Afloat* is an arbitrary estimate based on 1½ months' shipments as adopted by the Department of Commerce. *All Other Afloat* is determined by subtracting the amount of stocks in transit to the United States and Europe from the estimated total.
P—Preliminary estimate.

TOTAL WORLD STOCKS

(Figures from the Survey of Current Business)

At end of	1932	1933	1934	1935	1936*	1937
January	623,416*	634,797	661,948	698,153	600,479	454,249*
February	611,819*	626,227	663,308	686,195	599,355	445,265*
March	614,894*	638,428	666,382	678,809	583,318	447,856*
April	615,893*	629,159	658,796	677,006	567,172	428,249*
May	612,474*	626,537	689,239	677,569	541,871	413,134*
June	595,712	613,055	672,804	671,525	520,255	434,250*
July	589,037	618,258	676,200	679,061	519,074	445,782
August	597,274	617,449	674,702	680,644	500,520	457,462
September	599,986	623,683	694,361	661,509	493,585	470,768*
October	609,368	636,597	680,616	655,000	486,159	479,398*
November	614,342	642,968	684,408	617,300*	466,491	493,266*
December	629,898	654,890	705,975	613,987*	466,576	550,586*
Monthly Avge.	609,502*	630,171	677,395	666,397*	528,738	460,022*

* Revised.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis — Quarter	1930	1931	1932	1933	1934	1935	1936	1937
Jan.-Mar.	13,903	12,323	11,004	6,635	13,437	13,355	11,798	16,142
Apr.-June	16,487	16,295	12,980	14,412	13,565	12,597	15,443	16,421
July-Sept.	11,522	12,004	9,245	14,707	9,822	11,312	15,467	12,659
Oct.-Dec.	9,050	8,117	6,856	9,550	10,406	12,099	15,409	10,043
Total	50,962	48,739	40,085	45,304	47,230	49,363	58,117	55,265

Shipment Figures on Quarterly Basis — Quarter	1930	1931	1932	1933	1934	1935	1936	1937
Jan.-Mar.	13,318	11,268	8,760	6,981	10,730	11,154	10,944	14,667
Apr.-June	15,599	15,919	18,021	15,139	14,998	13,473	16,530	16,324
July-Sept.	15,027	14,354	8,141	13,707	11,648	13,489	14,558	13,591
Oct.-Dec.	9,694	8,510	5,329	8,265	9,310	12,066	13,331	10,864
Total	53,638	50,051	40,251	44,092	46,686	50,182	55,363	55,446

Inventory Figures [2] — Quarter	1930	1931	1932	1933	1934	1935	1936	1937
Jan.-Mar.	12,513	10,014	9,878	7,290	11,651	11,675	9,087	12,488
Apr.-June	13,277	10,447	4,999	6,615	10,219	10,755	7,835	12,529
July-Sept.	9,812	8,158	6,096	7,595	8,419	8,288	9,012	11,615
Oct.-Dec.	9,003	7,775	7,644	8,888	9,455	8,196	11,114	10,776

FIGURES FOR RECENT MONTHS

	PRODUCTION 1936	PRODUCTION 1937	PRODUCTION 1938	SHIPMENTS 1936	SHIPMENTS 1937	SHIPMENTS 1938	INVENTORY [2] 1936	INVENTORY [2] 1937	INVENTORY [2] 1938
Jan.	4,579	4,980	2,743	3,875	4,509	2,490	8,917	11,377	10,988
Feb.	3,579	5,246	....	3,212	4,371	....	9,265	12,308	.....
Mar.	3,640	5,916	....	3,857	5,787	....	9,087	12,448	.....

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis — Quarter	1930	1931	1932	1933	1934	1935	1936	1937
Jan.-Mar.	14,182	11,989	10,721	6,230	12,823	12,553	11,935	15,715
Apr.-June	15,995	15,388	11,913	13,001	13,191	11,631	14,678	15,299
July-Sept.	12,552	12,839	8,286	14,356	10,321	11,270	15,377	11,949
Oct.-Dec.	9,691	8,117	5,970	9,000	9,891	12,425	15,257	8,890
Total	52,420	48,333	36,890	42,587	46,226	47,879	57,247	51,853

Shipment Figures on Quarterly Basis — Quarter	1930	1931	1932	1933	1934	1935	1936	1937
Jan.-Mar.	13,921	11,251	8,918	6,539	10,640	11,252	11,410	14,497
Apr.-June	15,187	15,314	16,271	13,292	14,553	11,928	15,169	15,380
July-Sept.	16,158	15,282	7,761	13,370	11,545	13,251	15,125	12,805
Oct.-Dec.	9,672	8,174	4,961	8,189	8,306	11,636	12,921	9,741
Total	54,938	50,021	37,911	41,390	45,044	48,067	54,625	52,423

Inventory Figures [2] — Quarter	1930	1931	1932	1933	1934	1935	1936	1937
Jan.-Mar.	13,179	10,475	9,448	6,369	10,244	10,406	8,692	11,904
Apr.-June	13,612	10,504	5,174	6,097	8,795	10,050	8,105	11,746
July-Sept.	10,065	8,095	5,753	7,008	7,639	7,565	8,627	11,242
Oct.-Dec.	9,999	7,922	6,749	7,815	9,180	8,231	10,985	10,056

FIGURES FOR RECENT MONTHS

	PRODUCTION 1936	PRODUCTION 1937	PRODUCTION 1938	SHIPMENTS 1936	SHIPMENTS 1937	SHIPMENTS 1938	INVENTORY [2] 1936	INVENTORY [2] 1937	INVENTORY [2] 1938
Jan.	4,592	4,801	2,388	4,168	4,391	2,342	8,623	11,100	10,198
Feb.	3,556	5,091	....	3,446	4,536	....	8,699	11,734	.....
Mar.	3,787	5,823	....	3,796	5,570	....	8,692	11,904	....

[1] Based on reports received from the Rubber Manufacturers Association.
[2] Held by manufacturers at end of period indicated.

Automobile Production

	United States Total	United States Passenger Cars	United States Trucks	Canada Total	Canada Passenger Cars	Canada Trucks	Grand Total
1928	4,357,384	3,826,613	530,771	242,382	196,737	45,645	4,599,944
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933*	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934*	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935*	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936*	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937*	4,808,974	3,915,889	893,085	207,000	152,631	54,369	5,015,974
1937*							
July	438,968	360,400	78,568	17,941	12,513	5,428	456,909
Aug.	394,330	311,456	82,874	10,742	5,814	4,928	405,072
Sept.	171,213	118,671	52,542	4,417	1,926	2,491	175,630
Oct.	329,876	298,662	31,214	8,103	7,378	725	337,979
Nov.	360,055	295,328	64,727	16,574	13,793	2,781	376,629
Dec.	326,234	244,385	81,849	20,652	14,384	6,268	346,886
1938							
Jan.	210,450	156,387	54,063	17,624	13,385	4,239	228,074

* Revised.
Note: U. S. figures represent factory sales; Canadian figures represent production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA [1]							DUTCH EAST INDIES [6]						
	Gross Exports	Imports	Gross Exports Minus Imports	Ceylon [2]	India & Burma [3]	Sarawak [4]	British North Borneo [5]	Siam [6]	Java & Madura	Sumatra E. Coast	Other D.E.I.	Indo-China [8]	Amazon Valley	All Other [9]	World Total [7]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,366	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,294	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	35,551	83,978	125,969	208,699	43,387	14,565	12,721	1,119,565
1936:															
July	53,114	19,038	34,076	3,773	1,359	1,399	1,035	3,734	6,133	8,578	17,946	2,738	964	933	82,668
Aug.	43,506	13,361	30,145	3,940	776	2,541	656	3,284	4,978	7,353	12,106	3,017	542	1,054	70,392
Sept.	44,110	10,039	34,071	5,367	664	1,139	537	3,259	4,531	6,241	10,175	3,505	1,119	937	71,545
Oct.	46,543	12,960	33,583	5,599	1,181	2,143	1,086	3,349	6,477	8,145	12,881	3,874	1,255	1,105	80,678
Nov.	47,342	16,923	30,419	4,960	1,322	1,950	701	2,260	5,398	7,109	16,718	3,872	1,592	1,163	77,464
Dec.	38,714	9,758	28,956	4,377	1,844		506	2,988	6,472	10,129	9,536	8,450	1,721	1,087	76,072
1937:															
Jan.	41,571	16,956	24,615	4,514	1,066	4,015	1,224	3,849	5,176	7,962	13,067	2,823	1,271	943	70,495
Feb.	38,058	14,048	24,010	5,603	1,876	2,015	790	3,554	5,484	7,616	12,486	3,081	1,692	929	69,136
Mar.	59,568	19,579	39,989	7,049	2,034	1,425	1,239	3,873	7,856	11,817	19,903	3,160	1,749	872	100,966
Apr.	58,718	17,136	41,582	3,419	1,186	2,960	783	1,899	6,999	8,916	15,944	2,098	1,522	962	88,270
May	51,152	17,350	33,802	4,607	1,007	742	778	2,238	7,530	8,939	20,835	2,888	1,063	1,010	85,439
June	54,809	23,614	31,195	5,149	1,092	1,890	813	2,933	8,269	12,290	24,804	3,673	762	945	93,815
July	71,863	26,100	45,763	6,279	966	2,543	1,414	3,175	7,512	11,557	23,520	5,563	854	1,416	110,562
Aug.	64,525	21,395	43,130	7,308	605	1,634	1,289	2,999	6,785	11,563	21,014	2,277	1,248	1,283	101,025
Sept.	67,414	19,065	48,349	5,804	1,092	2,659	969	3,173	6,402	10,862	19,611	4,131	1,007	1,145	105,204
Oct.	59,319	11,858	47,461	6,701	1,248	523	1,505	2,352	6,587	12,172	14,188	3,753	1,434	1,147	99,071
Nov.	57,850	12,396	45,454	4,391	2,135	2,517	1,327	2,549	6,310	10,003	11,596	4,556	963	1,037	92,838
Dec.	56,791	13,949	42,842	9,529	2,708	3,009	1,172	2,957	9,108	12,272	11,731	5,384	1,000*	1,032	102,744
1938:															
Jan.	47,986	17,078	30,908	5,222		3,262		3,234				6,326			

(1) Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 115 tons in 1923, 1,117 in 1924, 3,618 in 1925, 3,263 in 1926, 2,439 in 1927, 1,437 in 1928, 2,670 in 1929, and 1,274 in 1930. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments were equivalent to 18 tons in 1923, 93 tons in 1924, 6 tons in 1925, 20 tons in 1926, about ½ ton in 1927, and 1 ton in 1928, and practically none in 1929, 1930 and 1931. (3) Official statistics. (4) Imports into Singapore and Penang. (5) Exports from "Other D.E.I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 2,342 tons in 1923, 1,008 tons in 1924, 2,239 tons in 1925, 44 tons in 1926, 84 tons in 1927, 1,459 tons in 1928, 1,302 tons in 1929, and 2,656 tons in 1930. (6) Calculated from official import statistics of principal consuming countries, viz., United States, United Kingdom, France, Germany, Belgium and Netherlands, and includes guayule rubber. (7) This total includes the third column for British Malaya, "Gross Exports minus Imports," and all the figures shown for the other territories. * Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(*Long Tons*)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	17,000*	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,976
1936:															
Aug.	41,094	—1,581	4,513	6,556	3,781	4,305	1,500*	3,128	807	789	42	1,145	500*	989	67,440
Sept.	49,483	—12	4,393	6,006	2,393	5,195	1,500*	2,922	2,297	514	471	1,090	300*	624	77,176
Oct.	40,301	—87	4,752	7,232	3,110	6,600	1,500*	2,761	1,092	817	343	1,171	200*	1,026	70,818
Nov.	37,897	—742	3,282	6,500	4,308	3,961	1,500*	2,162	964	1,090	445	1,388	200*	823	63,778
Dec.	50,838	—4,926	4,688	7,458	1,193	8,698	1,500*	3,426	1,184	759	276	1,206	200*	1,701	78,201
1937:															
Jan.	42,655	33	4,430	7,041	1,632	8,357	1,700	2,633	582	854	269	1,115	200*	567	72,368
Feb.	44,398	—222	5,296	7,911	1,271	6,630	1,502	3,048	304	1,363	245	452	200*	837	73,233
Mar.	39,888	343	5,347	7,668	2,612	6,935	2,119	3,598	1,293	1,641	371	709	200*	601	72,727
Apr.	42,066	3,808	5,291	8,664	1,343	5,837	1,669	1,532	1,058	1,069	362	1,070	200*	1,445	80,414
May	48,506	6,100	5,558	6,706	4,187	8,596	2,772	1,886	1,290	2,113	361	1,576	200*	925	90,776
June	48,972	5,157	6,010	6,469	3,791	7,608	1,958	3,940	2,226	1,630	521	1,802	200*	1,150	91,434
July	43,018	10,628	4,306	7,860	1,946	4,851	2,719	2,150	1,902	851	497	1,409	200*	753	83,090
Aug.	49,485	15,757	4,488	8,752	3,506	4,409	2,569	1,226	2,153	1,013	382	1,386	200*	1,692	97,018
Sept.	56,685	15,671	4,820	10,595	2,396	3,666	1,941	1,391	3,184	1,258	337	1,648	200*	1,369	104,996
Oct.	52,926	11,899	4,278	8,076	5,998	2,059	951	2,500*	2,470	967	367	1,535	200*	988	94,105
Nov.	54,135	12,878	4,311	8,848	4,787	1,368	2,857	2,500*	1,935	925	313	970	200*	846	96,873
Dec.	69,660	10,655	5,736	9,580	2,619	1,995	1,976	2,500*	767	1,286	318	1,008	200*	1,890	110,190
1938:															
Jan.	45,596	15,458	4,769												

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced 12 per cent in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1] United States imports of guayule are included in this compilation. * Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE: THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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Rubber—Crude, Scrap, Reclaimed, Latex

CRUDE RUBBER
SCRAP RUBBER
HARD RUBBER DUST
BALATA — GUTTA PERCHA
Hermann Weber Company
67 Broad St., New York

CRUDE RUBBER
LIQUID LATEX
Members Rubber Exchange of N. Y., Inc., and Rubber Exchange Clearing House, Inc.
Charles T. Wilson Co., Inc.
99 Wall St. New York
AKRON OFFICE: 503 United Building

GUAYULE "Duro" Brand and AMPAR Rubber, washed and dried ready for compounding.
High Grade PLANTATION RUBBER from our own Estates
Continental Rubber Co. of N. Y.
745 Fifth Avenue New York

LATEX — COMPOUNDED
ALSO LATEX CHEMICALS
GENERAL LATEX CO.
106-108 WALKER ST., N. Y.
Telephone: CAnal 6-0433

LATEX
Normal, Concentrated, Processed
HEAVETEX CORPORATION
78 Goodyear Ave., Melrose, Mass.
Offices in New York, Akron, Chicago

RECLAIMED RUBBER—
For All Purposes
LATEX in All Concentrations
NAUGATUCK CHEMICAL
Div. of U. S. Rubber Products, Inc.
1790 Broadway, N. Y. City

RECLAIMED RUBBER—
Uniformity, reliability, cleanliness
Pequanoc Rubber Co.
Butler, N. J.

RECLAIMED RUBBER—
A standardized grade for every requirement.
U. S. Rubber Reclaiming Co.,Inc.
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"55 Years Serving the Industry Solely as Reclaimers"

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Highly Concentrated (About 75%)
RUBBER LATEX
Sole Distributors for U. S. A. and Canada
Revertex Corp. of America
80 Broad Street New York, N. Y.

RUBBER
Crude Rubber
Liquid Latex
Ernest Jacoby & Co.
79 Milk St. Boston, Mass.
Cable Address: Jacobite Boston

RUBBER—
Scrap and Crude
Also HARD RUBBER DUST
A. Schulman, Inc.
1006 Akron Savings & Loan Bldg., Akron, Ohio
1401 Mississippi Ave., E. St. Louis, Ill.
736 Statler Bldg., Boston, Mass.
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CONSULTING CHEMIST
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Phone: COrtlandt 7-8053

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LATEX TECHNOLOGIST
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21 Woodland Road, Malden, Mass.

CONSULTING
Rubber Technologist
R. R. Olin Laboratories
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Telephones: Sherwood 3724, Franklin 8551

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RUBBER GOODS
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New Articles
Developed and Manufactured
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SALESMAN—To represent small factory equipped to manufacture rubber specialties. Full or part time. Must have experience and following in this particular field of business. Attractive commission basis. State full experience and reference in first letter. All replies will be held in strict confidence. Address Box 919, THE RUBBER AGE.

POSITIONS WANTED

CHEMICAL ENGINEER—Experienced in all types of rubberizing production and compounding. Address Box 923, THE RUBBER AGE.

GENERAL FOREMAN—Practical man with 18 years' experience in rubberizing fabrics for the automotive manufacturers, upholstery cloth, raincoats, hospital sheetings. Address Box 921, THE RUBBER AGE.

LATEX TECHNOLOGIST with over 8 years' laboratory and plant experience; qualified to develop new latex products or perfect present processes; desires position with manufacturer. Address Box 922, THE RUBBER AGE.

EQUIPMENT FOR SALE

FOR SALE: Complete line of used Rubber Equipment including Mills, Calenders, Hydraulic Presses, Vulcanizers, Banbury Mixers, Dryers, etc. Send for complete list. CONSOLIDATED PRODUCTS CO. INC., 14-19 Park Row, New York, N. Y.

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